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ABSTRACT

This four-chapter monograph, translated from a 1977 Russian book written originally in Russian for Russians, describes methodology and results of the study of cognitive activity in children with cerebral palsy. An initial chapter reviews research on impairments in cognitive activity and speech defects in such children and on methods of remediation. The second chapter describes techniques developed and used in psychological and speech therapy examinations that assess, such areas as the articulatory system, emphatic speech, cognitive activity, and motor capacity. Chapter III traces psychomotor and verbal development of normal and cerebral palsied children at successive age levels. Lastly, in chapter IV, an approach to psychological and speech remediation is outlined for infants, preschoolers, and primary students (K-3). Suggestions focus on such aspects as development of spatial imagination, visual perception of color, development of temporal imagination, development of oral speech, and overcoming pronunciation defects. (CL)

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23 METHODS OF IMPROVING THE COGNITIVE AND VERBAL DEVELOPMENT OF CHILDREN WITH CEREBRAL PALSY

Author: L. A. Danilova Translator: Robert H. Silverman

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International Exchange of Information in Rehabilitation

MONOGRAPH NUMBER TWENTY THREE

METHODS OF IMPROVING THE COGNITIVE AND VERBAL DEVELOPMENT OF CHILDREN WITH CEREBRAL PALSY

Author: L. A. Danilova
Turner Research Institute
of Orthopedics and Traumatology
Leningrad, USSR

Translator: Robert H. Silverman

International Exchange of Experts and Information in Rehabilitation
World Rehabilitation Fund, Inc.
400 East 34th Street
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Leslie D. Park, Executive Director
UCP of New York City

FOREWORD AND ACKNOWLEDGEMENTS

The WRF under a grant from the **National Institute of Handicapped Research** has the privilege of "importing" knowledge from other countries through the publication of monographs in a monograph series in the International Exchange of Experts and Information in Rehabilitation.

As you will note from the list in the back of this book, we have "imported" knowledge from several countries including the United Kingdom, Denmark, Sweden, Finland, Australia, New Zealand, Yugoslavia, France and Switzerland.

This twenty-third entry in the *Monograph* series is a book written originally in 1977 in Russian for Russians, and translated this year (1983) for the first time for WRF. We hope that you will be as excited by this "event" as we are and that you will find the content valuable in your practice.

This translation should be an encouragement to others in the field to continue to develop communication links with U.S.S.R. It is a hope that in the future WRF will also be involved in other translations of significance to rehabilitation from the Soviet Union.

We are grateful to **NIHR,** George Engstrom, Director of Utilization and Mary Catharine Jennings, Project Officer, for promoting our efforts.

Leslie Park, Executive Director of UCP NY has been most encouraging regarding WRF's efforts to import information on cerebral palsy available in the literature in the Soviet Union to the U.S. His commentary appears after the Danilova work.

Without Robert Silverman, the translator, we would not have had this book at all and so we are extremely pleased that he took such an interest in this undertaking.

And finally, we are indebted to the Copyright Agency of the U.S.S.R. who on behalf of Dr. L.A. Danilova, the author of the book **Methods of Improving the Cognitive and Verbal Development of Children with Cerebral Palsy,** Meditsina, Moscow 1977, has granted us permission to publish her book in English without fee.

Howard A. Rusk, Jr.
President
World Rehabilitation Fund, Inc.

TRANSLATOR'S NOTE

The original text of the present translation was supplied by the Survey of Recent East European Mathematical Literature at the University of Chicago from its library collection. The Survey has been supported since 1956 by the National Science Foundation, Science Education Directorate (grant #76-80599). Over the years, the Survey has focused on mathematics and mathematics education at all levels in the Soviet Union and Eastern Europe. A total of 54 Russian books have been selected, translated and adapted, and published in English. Of these, 39 were in the field of mathematics, while 15 presented Soviet research in the psychology of learning and teaching mathematics.

In the early 1970's, an exchange program was established between the Survey and the Institute of Defectology of the USSR Academy of Pedagogical Sciences. The focus of the Survey was extended to include Soviet research in the psychology and education of handicapped children, particularly the mentally retarded and those afflicted with disorders in speech, hearing, and vision. A unique collection of several hundred of the most significant Russian studies has been accumulated, two of which (*Problem-Solving Processes of Mentally Retarded Children* and *Teaching Mathematics to Mentally Retarded Children)* have been translated and published as part of the series, *Soviet Studies in the Psychology of Learning and Teaching Mathematics.*

I would like to thank Professor Izaak Wirszup, Director of the Survey, for making the original Russian text available for translation.

INTRODUCTION

In the description of infantile cerebral palsy adopted by an international group of researchers meeting at Oxford in 1958 (see M. Capes, 1958*), it was noted that the affliction is attributable to brain disease that affects areas specifically responsible for body movement and posture. It was also emphasized that the disease is acquired at the early stages of brain development.

What is at issue here is thus a diffuse brain lesion found at the early stages of development of the brain whose ramifications may involve sensory and speech disturbances in the afflicted child. Moreover, because of motor impairments, cognitive activity in the cerebral palsied child may present special problems in the course of development, inasmuch as sensory cognition is created through the analytic processes of the brain.

The different modes of sensory cognition (sensation, perception, and imagination [predstavlenie†]) constitute the basic stages or points in the development of man's sensory knowledge about objective reality. The normal child gets to know about the world by analyzing all the information presented to his sensory system by nature. As is well known from the literature, as early as the third or fourth month of life, the infant will reach out towards objects.

Children suffering from cerebral palsy and whose hands display paretic symptoms usually experience difficulty in handling objects. If paresis of the feet is also present, this will sharply limit the child's motor activity, and thereby restrict even further the kinds of objects he is able to hold in his hands. Thus the development of the child's cognitive activity will lag behind.

As early as four months of age, the normal infant will try to grasp any object and, besides feeling it with his hands, will also explore it with his lips and tongue. In this way, he gains his first sensations and trace images about texture, shape, size, thickness, weight, temperature, and even the taste of different objects. The cerebral palsied child receives a very small fraction of this information, and as a result lags behind in the development of stereognosis, and tactile and temperature sensitivity. Words denoting these concepts consequently will not appear in his vocabulary later on. Once the normal child is one year old, he begins to walk on his own and at once the range of objects he can hold in his hands increases dramatically. Moreover, now he acquires qualitatively new information about space and time, learns how much more difficult it is to reach the kitchen than the couch or the table, and what kind of problems may be expected when he falls down the stairs. At the same time, he begins to notice direction and orientation with respect to objects. The cerebral palsied child lacks these impressions.

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* Added in translation.

† Literally "representation", which in Soviet psychology refers to trace images or images created through imagination. (c.f. Great Soviet Encyclopedia, MacMillan 1972). Here it has been translated as "imagination," "trace images," or simply "images." [trans.]

I. M. Sechenov remarked long ago that walking is the most important factor in the formation of space and time perception. From this standpoint, it is clear how the normal child, in the course of locomotion, begins to grasp the difference between the amount of time spent on different excursions from one spot to another, whether a trip from one room to another or a stroll in the park. Time flows far more monotonously for the child who is bedridden because of illness. Basically because of a lack of information, the level of analytic and synthetic relations remains underdeveloped in such a child, as does his receptive and expressive vocabulary. From several years of observations of over 1000 cerebral palsied children who had been treated at the Turner Research Institute for Orthopedics and Traumatology, Leningrad Regional Boarding School No. 9, and the Komarovo Sanitorium, we drew conclusions about other aspects of the disease as well. Organic brain lesions in combination with improper education, underdevelopment in the cognitive sphere, and an inadequate vocabulary are responsible for disturbances in the emotional and volitional domains. Published data and our own experience lead us to believe that proper teaching, therapy, and child-rearing of the afflicted child can, if started at birth, often produce varying degrees of compensation and forestall retardation in cognitive activity, speech, and the emotional and volitional domains.

Cerebral palsy is an extremely serious condition in which a motor defect is, as a rule, combined with retardation in mental development and lesions to the verbal and motor analysors. Attitudes towards individuals with cerebral palsy have undergone a series of changes in the historical development of human society (M. N. Goncharova *et al.*, 1974). In ancient times, physical perfection was particularly admired. Though Plutarch saw in the crippled child, "a being destined for life, but lacking strength and health," Plato could write, "It would be necessary to forbid, by means of legal statute, any expression of concern for those born as freaks." Only in the middle ages were the first efforts made to help individuals suffering from physical defects. In Russia "beggars and orphans" were always cared for and protected. On the other hand, for many centuries individuals with crippling diseases were neither treated nor educated. Only at the start of the twentieth century were the first attempts made at educational and medical remediation of afflicted children. Interestingly, physicians understood the need for special education before educators did, and were the first to study the abnormal child.

As early as 1882, The Blue Cross society was created in St. Petersburg for the purpose of caring for poor and sick children. In 1890, several members of the society opened a Shelter for Crippled Children and Paralytics in St. Petersburg, on Lakhtinskaya Street, where G. I. Turner served as consultant physician starting in 1904. At the Maximilian Hospital a second institution was created in 1897: a school for teaching trades to physically impaired individuals. In the very early years of the Soviet regime, homes were created for crippled children in Kiev (1919) and Odessa (1929)

which were subsequently reorganized as institutes. The Soviet government was the first in the world to take upon itself the responsibility of caring for crippled children (Resolution of February 25, 1932 of the Council of People's Commissars of the Russian Federated Soviet Socialist Republic, Decree No. 666 of the USSR Ministry of Health and No. 679 of the Ministry of Health of the Russian FSSR, and others).

Currently, in nearly all advanced countries efforts are made to treat and educate children with cerebral palsy. In most cases, however, this is conducted in private institutions, and consequently, depends upon the financial support of the patient's relatives. In the Soviet Union, according to the rights established in the Constitution of the USSR, all individuals with cerebral palsy receive treatment and instruction. According to resolutions passed by the Central Committee of the CPSU and USSR Council of Ministers (Measures for Further Improvement in Public Health (1968 and 1977)), an extensive network of specialized institutions, including hospitals, kindergartens, and boarding schools that provide cerebral palsied children with all necessary treatment and instructional programs has evolved and is continuing to grow.

Thus, every specialist concerned with the rehabilitation of cerebral palsied children is confronted by two problems: first, the design of a universal system of medical and educational examination of these children, and second, the introduction and implementation of methods for remediation of those impairments which have already been identified.

The present book discusses methodology and results of a study of a number of forms of cognitive activity in children suffering from cerebral palsy at different age levels (from 0 to 10 years of age), and presents a system of remediation. The book has been written for speech therapists, psychologists, and educators engaged in the treatment of children with cerebral palsy for disturbances in cognitive and verbal functions. It may prove useful to pediatricians, pediatric neurologists, and psychologists concerned with the early diagnosis and rehabilitation of cerebral palsied children. Further, the methods discussed here can also be used for children (in suitable age groups) with retarded cognitive and verbal functions caused by different etiologies.

The book does not pretend to elucidate every area of cognitive activity and speech that may be distorted in the child with cerebral palsy. Nor can it be claimed that the methods given in the remediation exercises are exhaustive; they may be varied indefinitely, expanded upon, and added to.

Our goal is to alert rehabilitation therapists and parents to the necessity of early diagnosis of retardation of mental development and to the fact that compensatory steps at the infantile stage may prevent further retardation and development of deviant cognition and speech.

I wish to express my appreciation to L. F. Fedorova and O. F. Begunova for their assistance in the preparation of the text of the present work.

CHAPTER 1: PUBLISHED DATA ON IMPAIRMENTS IN COGNITIVE ACTIVITY AND SPEECH DEFECTS. METHODS OF REMEDIATION FOR CHILDREN SUFFERING FROM CEREBRAL PALSY

Disturbances in cognitive activity. It is no accident that nearly every study on cerebral palsy is concerned with elements of the cognitive activity of children with the disease. Many writers have pointed out how uneven is the mental development of cerebral palsied children. M. O. Gurevich and N. I. Ozeretskii (1935) remarked on the loss and decay in certain intellectual functions, and the retention of others. N. and P. Botta (1964) have pointed to retardation in cognitive activity in children with cerebral palsy; the same observation was made by M. B. Eidinova and E. N. Pravdina-Vinarskaya (1959), R. Ya. Abramovich-Lekhtman (1962), K. Hickey (1962), and others. W. M. Cruikshank and G. M. Raus (1955) believed that an inability to make generalizations is the major impairment in the intellectual development of children with cerebral palsy. Further, E. O. Kirichenko (1962) showed that in children with cerebral palsy, the lag in the development of arithmetical ability contrasts with a relatively well-preserved ability to generalize, though the breadth and store of knowledge is highly limited. Inability to realize complex modes of perception and difficulties in abstract thought have also been observed in cerebral palsied children by E. Haeussermann (1964).

As is well-known, cognitive activity is an extraordinarily complex function. This form of activity results from the development of stereognosis, the full range of forms of perception, spatial imagination as well as certain other aspects of intellectual life. Disturbances in stereognosis, particularly in individuals suffering from cerebral palsy, were first pointed out by C. Wernicke (1874). Wernicke established that impairments in the stereognostic sensitivity will not be of the same degree as disturbances in other types of skin sensitivity and may occur even where the latter remains fully intact. In the literature, cases are described in which different forms of cerebral palsy are accompanied by manifestations of astereognosis. As early as 1900, V. P. Osipov† presented an example of a patient in which astereognosis was combined with ataxia. Further, by 1899 E. Claparède had already published a comparative description of two patients, in one of whom paralysis of the hands existed from birth and was accompanied by pronounced stereognosis, and in the other stereognostic sensitivity was preserved, despite contracture and impaired sensitivity. S. S. Minukhin (1958) described a group of children with impaired stereognosis who also exhibited spasmodic hemiparesis. N. and P. Botta (1958) observed disturbances in the tactile discrimination of geometric shapes in different forms of cerebral palsy. In 1963, N. K.

† Citations accompanied by a dagger were given in the original without full bibliographic information; this information could not be located in the course of translation and so these citations are not listed in the literature.[Trans.].

Bogolepov and K. A. Semenova also established that in all forms of cerebral palsy there is a highly arrested development of the kinesthetic analysor. This is clear from the fact that the analysor exhibits too low a level of constitutional lability and too high an excitation threshold, from the standpoint of the child's chronological age.

There are data in the literature that point to other forms of impairment of cognitive activity in cerebral palsied children. A number of writers have indicated defects in visual perception in infantile cerebral palsy. Thus K. and B. Bobath (1956) remarked on the visual agnosia found in cerebral palsied children. N. and P. Botta (1964) and G. Tardieu (1966) observed that cerebral palsied children may sometimes incorrectly identify objects of different shapes when relying on sight. This has also been noted by E. Haeussermann (1964), who remarked that afflicted children have trouble distinguishing geometric shapes. The interdependence of the visual perception of shape and impairments in the stereognostic function was also emphasized. That is, disturbances of the stereognostic function do not always lead to defects in the visual perception of shape, though poor visual perception of shape is, as a rule, associated with astereognosis. Interestingly, these visual disturbances are accompanied by impairments in spatial imagination (S. A. Bortfel'd, 1971; L. A. Danilova, 1969, 1972; and M. K. Poppandova, 1971). This fact has also been pointed out by other writers (e.g., B. C. Wilson, 1967; N. and P. Botta, 1968; and M. K. Eidinova and E. N. Pravdina-Vinarskaya, 1959). Wilson remarked on the difficulties afflicted children have in distinguishing between vertical, horizontal, and inclined positions. They observed one child who did not get out of bed until she was eight years old, and noted that this was the first time the girl could tell where her body ended and the bed began. N. and P. Botta (1958) emphasized the child's inability to orient himself to his own body. Similar disturbances have been pointed out by K. and B. Bobath (1956), A. Benton and A. Kemble (1960), and L. A. Danilova (1969). After showing that the ability to perform drawing exercises was intact in 100 patients with brain lesions and 100 non-neurological patients, A. Benton and M. Fogel (1962) explained that most patients with cerebral palsy performed the exercise incorrectly; the type of error was not described, however.

These data from the literature point to the difficulties that affect cognitive activity in the cerebral palsied child, and consequently, the need for the design of remediation measures that can help in compensating for these impairments.

Speech defects. A number of writers have observed a variety of speech disorders in children with cerebral palsy (M. Ya. Breitman, 1902; M. O. Gurevich and N. I. Ozeretskii, 1935; M. B. Eidinova and E. N. Pravdina-Vinarskaya, 1959; W. Phelps, 1945; N. and P. Botta, 1958; G. Tardieu, 1966). The multiple nature of speech defects has been emphasized. Thus M. Ya. Breitman (1902) noted that there are a variety of speech disorders in cerebral palsy – from simple pronunciation defects (slow, heavy speech) to aphasia.

Dysarthria is the most common speech defect in cerebral palsy. As early as 1843, W. Little, in his description of intrauterine and birth cerebral lesions, had noted that "...the speech muscles are also usually affected, and speech defects are observed from simple indistinctness in pronouncing certain letters, to a complete loss of articulate speech. Frequently, speech is as slow and laboured as other volitional acts. Swallowing is often difficult in the first months of life and only after a considerable lapse of time does the child learn not to let his saliva flow out of his mouth, but to swallow it..."

Numerous writers have emphasized the variety of manifestations of dysarthria. V. A. Muratov (1898) pointed out that the form of dysarthria seen in cerebral palsy is spasmodic and paretic in nature. This was basically the first attempt at classifying the different forms of dysarthria. M. Ya. Breitman (1902) compared the dysarthria of cerebral palsy to choreatic aphasia, a disease in which the child is unable to speak because of spasms in the speech system. S. A. Chugunov (1910), H. Gutzmann (1924), and I. M. Prisman (1938)† noted that infantile pseudo-bulbar paralysis is usually accompanied by hyperkineses. In effect, a form of dysarthria was described that now is referred to as hyperkinetic dysarthria. The symptoms of this form of dysarthria were also described by W. M. Cruickshank and G. M. Raus (1955), and in monographs by E. R. Carlson (1941) and M. Zeeman (1962). I. I. Panchenko (1974) has given a detailed analysis and description of the clinical features of hyperkinetic dysarthria.

Thus, it is clear that by the end of the nineteenth century attempts were already being made not only to identify dysarthria or the various symptoms in cerebral palsy, but also to describe its different clinical forms. Subsequent studies have only complemented and extended our ideas about this frequently encountered form of cerebral palsy. Particular emphasis has been placed on the classification of the different forms of dysarthria (K. N. Vittorf, 1940; M. B. Eidinova and E. N. Pravdina-Vinarskaya, 1959; I. I. Panchenko, 1974; K. and B. Bobath, 1956); the classification has since been refined and enriched.

Two forms of pseudobulbar paralysis have been identified: spastic and mixed forms of motor paralysis (K. N. Vittorf, 1940). K. and B. Bobath (1956) described several forms of pseudobulbar paralysis occurring in cerebral palsied children, including spastic, athetotic, ataxic, and mixed forms of motor paralysis. I. I. Panchenko (1974) proposed a working classification of the different forms of pseudobulbar paralysis: (a) spastic-paretic dysarthria; (b) severe hyperkineses; (c) anarthria; and (d) defects in the vocalizing and respiratory musculature together with asynchronous breathing, voice formation, and articulatory processes.

M. B. Eidinova and E. N. Pravdina-Vinarskaya (1959) proposed the most comprehensive and clear classification of dysarthria in cerebral palsy, identifying the following forms of pseudobulbar paralysis: paralytic, spastic, hyperkinetic, motor, and rudimentary or superficial. The authors did admit that their classification of the various forms was provisional and based on the

dominant clinical symptom, however.

Other speech disorders besides dysarthria have been observed in infantile cerebral palsy. As early as 1902, M. Ya. Breitman had described different forms of aphasia. M. O. Gurevich and N. I. Ozeretskii (1935) also observed motor aphasia. N. N. Traugott and S. I. Kaidinova (1975) presented cases of motor alalia occurring in infantile cerebral palsy. The different forms of alalia in children have also been noted by M. B. Eidinova and E. N. Pravdina-Vinarskaya (1959), N. and P. Botta (1964), and others. G. Tardieu (1966) described cases of sensorimotor speech disorders in afflicted children.

Certain researchers have remarked on the late development of speech in children with cerebral palsy, in addition to aphasia and alalia. M. Ya. Breitman (1902) and M. O. Gurevich and N. I. Ozeretskii (1938) also described cases of speech delay in the disease. Cases of late development of speech have been cited by K. and B. Bobath (1956), N. and P. Botta (1958), and M. B. Eidinova and E. N. Pravdina-Vinarskaya (1959). M. Zeeman (1962) emphasized that children with the disease often do not speak until four years of age. A lag in speech development in cerebral palsy was also remarked upon by M. F. Deshchekina (1955).

Many studies have drawn attention to the need for careful study of hearing in cerebral palsied children. Hearing defects which usually cannot be established in physical examinations, have been noted by K. and B. Bobath (1956); W. M. Cruikshank and G. M. Raus (1955) also cited hearing disturbances. N. and P. Botta (1964) established that hearing may be affected in about a tenth of all afflicted children. However, it should be noted that their data diverge somewhat from the observations of L. Fisch (1955; cited by K. and B. Bobath, 1956), who indicated that the cortical terminus of the acoustic analysor is affected in one-fifth of all cerebral palsied children, and the data of A. B. Albitreccia (1961),† who found this defect in one-third of all such cases.

In the literature, it is noted that writing defects are also usually observed in children with pseudobulbar disturbances. R. E. Levina (1967) showed that in afflicted children, speech is blurred and that both articulation and writing are affected.

It is clear from these data that a variety of speech defects occur quite often in infantile cerebral palsy. Prompt and individualized remediation of these defects is a simple necessity. Thus in the next section we will consider the present state of remediation efforts in this field.

Remediation of disorders in cognitive activity and speech. The need for special instruction for children suffering from cerebral palsy so as to overcome impairments in cognitive activity and speech has been emphasized by a number of writers. Gunes (1961)† noted that instruction must be designed to overcome retardation in intellectual development. E. R. Carlson (1941) emphasized the seriousness of this problem, and claimed that education is far

more important for the child with cerebral palsy than it is for the normal child. "...The severity of the physical affliction is a secondary criterion for assessing the cerebral palsied child. For such a child, education, along with efforts to compensate for the affected portion of the brain, can help in identifying the child's true abilities and help him find a place in life."

There are two trends in the literature with regard to treatment and instruction for children suffering from different forms of cerebral palsy. It has been suggested that treatment is effective only if there are no major impairments of intelligence in the afflicted child. E. P. Mezhenina (1965) has assumed that acute impairment of intelligence is a counterindication for all forms of therapy. This point of view is also shared by N. V. Banduristii (1959), who developed a surgical management technique for children. In an analysis of clinical data covering 370 cases of cerebral palsy, M. Skatvedt (1958) was also led to conclude that treatment yields results only if intelligence remains unaffected. The same conclusion was reached by T. T. S. Ingram *et al.* (1959)† in their study of 60 children with cerebral palsy. In this study, it was found that treatment of children with I.Q. below 70 (Gesell scale) does not produce satisfactory results.

There is also a second point of view common in the literature, according to which mentally retarded children should also be given treatment and instruction. M. B. Eidinova and E. N. Pravdina-Vinarskaya (1959) have asserted that all forms of remedial work with children suffering from cerebral palsy become more effective if the child has unimpaired intelligence and a lively interest in getting well. In this connection, it was shown that treatment and instruction may result in significant progress even in the mentally retarded child. These same views are held by N. and P. Botta (1964) and E. Haeussermann (1964).

There are now a number of specialists working with cerebral palsied children who believe that all afflicted children need treatment and instruction. Specialists must bear in mind that the cerebral palsied child quite often may be mistaken for a mentally retarded child because of physical appearance or developmental features. Special training is needed to study the child's intelligence and, consequently, determine the outlook for compensatory treatment. This thought is due to V. Cardwell (1956), who developed a technique of specialized clinical psychological examination. By means of this technique, it was found that motor disturbances and speech defects in afflicted children may interfere with a correct evaluation of their intelligence. These studies also led Cardwell to conclude that an awareness on the part of physicians and psychologists of the special traits of cerebral palsied children, in conjunction with the design of suitable methods of intelligence testing of the afflicted child, can help in achieving a more accurate evaluation of the child's mental abilities. The true extent of mental retardation among cerebral palsied children can then be determined.

Let us now review the various discussions in the literature of methods of

compensating for impaired functions of cognitive activity and speech in cerebral palsy. To overcome stereognostic disorders, N. and P. Botta (1964) proposed a series of procedural techniques to help the child adapt to his surroundings, techniques, we might add, which make the child's hands more compliant. K. A. Semenova *et al.* (1972) produced improved stereognosis in cerebral palsied children by pulses of electric current delivered to the distal portions of the limbs using a specially developed technique. Working with another specially developed technique, improvements in the stereognostic function were also observed by G. F. Gorodetskaya (1972). N. and P. Botta (1964) and G. Tardieu (1966) described a number of procedural techniques for the development of visual perception in the child. Several writers (M. B. Eidinova and E. N. Pravdina-Vinarskaya, 1959; S. A. Bortfel'd, 1971; E. V. Zelenina and Z. P. Manukhina, 1973) noted that exercise therapy with afflicted children can improve their orientation to their surroundings. The importance of specialized instruction for rehabilitation of pre-school cerebral palsied children has been also emphasized by S. S. Kalizhnyuk (1973).

As for speech disorders, quite a number of writers have remarked on the difficulties involved in compensatory measures here. A. Posniak *et al.* (1958) presented considerable information in an analysis of the medical histories of 53 cerebral palsied patients 5–21 years of age. Speech defects were found in all the patients. For a period of 11 months, exercise therapy and remediative classes were conducted with the patients. The therapy resulted in significant improvements in the motor sphere in all the patients, though speech disorders remained.

In an analysis of experience gained in the treatment of young children at the Malakhovka Sanitorium, A. V. Efimov (1962) was led to conclude that pseudobulbar paralysis is not amenable to treatment. By contrast, Z. I. Tel'nova has recommended a number of procedural techniques of speech therapy with young children based on her own experience from as far back as 1940 [q.v.]. Success in speech therapy with young children suffering from severe dysarthria has been demonstrated by A. G. Ippolitova (1959) and O. V. Pravdina (1969).

N. and P. Botta (1958) have suggested a number of interesting techniques of speech therapy for use in infantile cerebral palsy. Emphasis was placed on the fact that, besides recovery of speech, it is also necessary to improve motor system functions so as to ensure the proper respiratory movements, monitor laryngeal reflexes in speech formation, and relax the tension of the head and neck. These suggestions have also been made by W. M. Cruikshank and G. M. Raus (1955) in remarking that the movements of the articulartory organs must be linked to articulatory processes.

M.B. Eidinova and E. N. Pravdina-Vinarskaya (1959) demonstrated the efficacy of drug therapy for pseudobulbar paralysis in conjunction with directed, rigorously individualized speech therapy. V. N. Shashurina (1963, 1975), L. A. Danilova (1969), and L. A. Danilova *et al.* (1975) have also pre-

sented examples that demonstrate the effectiveness of drug therapy in conjunction with speech therapy. K. A. Semenova *et al.* (1972) described significant speech improvement in cerebral palsied children obtained by pulse currents applied to the distal portions of the limbs; heightened mental activity associated with the improvement in speech was also observed. Similar conclusions have been reached by R. A. Lisitsina (1964).

In a study of educational work with children suffering from cerebral-localized palsy, G. N. Malofeeva (1964) established that the physical therapist must encourage a purposeful attitude, introduce goal-oriented situations into play, and maintain verbal control over each player and the thematic activity itself. I. I. Panchenko (1974) presented a working classification of speech defects and indicated the need for a differentiated approach to speech therapy. V. Tardieu (1966) pointed to the importance of articulatory and respiratory exercises in overcoming different types of speech defects, particularly in the remediation of dysarthria.

Procedural techniques for overcoming motor alalia in children with motor disturbances have been set forth by N. N. Traugott and S. I. Kaidinova (1975). The need for speech therapy for the purpose of vocabulary development and treatment of agrammatism in the child suffering from alalia was also indicated here.

It is significant that recent studies have focused on the efficacy of early diagnosis, and similarly, intervention in the child's development through speech therapy and instructional work in the pre-vocal period (K. A. Semenova *et al.*, 1972; E. M. Mastyukov, 1973; P. Ya Fishchenko *et al.*, 1975). Recent studies have emphasized the effectiveness of integrated speech therapy and instructional work in lessons with groups of cerebral palsied children (M. V. Ippolitova, 1967; L. A. Danilova and N. V. Gamuletskaya, 1974; L. A. Danilova *et al.*, 1975). These studies incorporated special techniques for overcoming reading and writing defects presented originally by Zh. I. Shif (1948), S. M. Blinkova (1955), B. G. Anan'eva (1960), V. K. Orfinskaya (1969), and A. R. Luria (1962).

Thus it is clear from the foregoing discussion that there are numerous indications in the contemporary literature as to the different types of disorders of cognitive activity and speech defects found in cerebral palsied children. Nevertheless, insufficient emphasis has been placed on remedial methods. Similarly, many studies have pointed out that therapy should start at the infant stage. But insufficient emphasis has been placed on the need for early diagnosis of impairments in cognitive activity and speech.

CHAPTER II: RESEARCH METHODS

In the present work, we will set forth results obtained from studies of functions of cognitive activity and speech that may become disturbed as a result of brain lesions and unique features of the motor development of the cerebral palsied child. Special techniques were selected to study these functions (stereognosis, visual perception of shape and color, spatial and temporal imagination, pronunciation, reading and writing, vocabulary, attention and memory). By means of these techniques, we were able to establish, first, whether this or that function was in fact impaired; and, second, the extent and nature of the impairment of the function. In our selection of the different techniques, convenience for work with children who – because of their disability – lacked a sufficient degree of control over their limbs, was taken as the deciding criterion. Both basic and auxiliary techniques were employed, the former being intended for the study of cognitive activity and speech, while the latter, for determining levels of mental development.

Our study is devoted to the remediation of underdeveloped functions in cerebral palsied children suffering from mental and speech retardation. Our goal is to help the afflicted child assimilate the curriculum used in the ordinary public schools.

The various techniques used here may be divided into two groups: (1) research methods, and (2) instructional techniques. In the experimental investigation of stereognosis, the central problem was to determine the subject's ability to recognize objects by means of touch. Here it was essential to take into account the state of the subject's tactile and temperature sensitivity.

In our study of visual perception, it was important to identify the subject's ability to distinguish shapes, as this is associated with the ability to differentiate between letters of the alphabet. In the case of spatial perception, we were interested in perceptual elements that underlie the development of the child's ability to differentiate between letters of the alphabet and to combine letters. Thus it was necessary to determine the subject's ability to (1) copy parts directly; (2) copy an entire model directly; (3) draw the mirror image of a part; (4) draw the mirror image of an entire model; and (5) perform tracing operations.

In these experiments, subjects were given constructional praxis exercises based on V. M. Smirnov's die-stamping technique.† To study the visual perception of shape, a technique was selected according to the same principle as that used in the study of stereognosis, though the technique itself was superficially distinct (the figures differed in terms of size, thickness, and a single color). Before the subjects were placed different geometric figures (spheres, trapezoids, rhombuses) and, after one of the figures had been pointed out, the subject was asked to find a similar figure. It took 30 seconds to find a similar figure; within this period of time the children in the control group (normal children) completed the task without error.

In our study of spatial imagination, emphasis was placed on the child's ability to orient himself to his body schema and understand spatial relations defined by corresponding prepositions and adverbs. We were also concerned with his ability at completing drawing exercises. Temporal imagination was evaluated by means of two criteria: (1) temporal sequence of events; (2) number of actions or events that could occur per unit of time. Our study of dramatic speech involved the understanding of direct speech (a) in narrowly defined situational contexts, and (b) from general standpoints (fluency, size of vocabulary). Vocabulary was assessed first in terms of the relationship between receptive and expressive vocabulary; second, in terms of the use and understanding of words denoting abstract, temporal, and spatial trace images; third, the analysis of relationships in the use of different parts of speech. In addition, emphasis was placed on the grammatical structure of the sentence (gender, number, case).

To describe the articulatory system, we reviewed the state of all speech and motor organs that are involved in pronunciation when in a state of rest, when attempting to speak, and in the course of the speech event. Distorted pronunciation was measured according to a commonly used speech therapy scale. Arithmetic operations and elements of thought processes were also tested by means of generally accepted techniques. Graphical skills were measured in terms of writing and drawing abilities. In the case of children who were able to read and write, the type of mistakes found was also analyzed.

In accordance with these tests, a technique was developed for the psychological and speech-therapeutic examination of cerebral palsied children. The technique can be employed by psychologists and speech therapists; certain elements may even prove useful in psychiatric and neurological examination.

Psychological and Speech Therapeutic Examination Chart for the Cerebral Palsied Child

A. Last name, first name, patronymic; month and year of birth

B. ***Basic diagnosis of illness. Description of state of analysors (acoustic and visual).***

C. ***Medical history.*** Emphasis is placed on the child's intellectual and verbal development. The age at which he begins to distinguish auditory and visual stimuli, recognize his mother and other relatives, follow an object with his eyes, reach out for playthings, smile, laugh, understand directed language and learn to make sounds, pronounce his first infant syllables, words, and whole sentences is also noted.

D. ***The child's motor capabilities,*** for example, ability to hold his head up, sit down, move on his own using stays, crutches, or orthopedic shoes, ability to meet his own needs, draw, and write.

E. ***Emotional and volitional domains*** (degree of social interaction or isolation, euphoria, tearfulness, affection, awareness of his disability and wish to be involved in remediation of pathological state).

F. ***State of articulatory system.***
   1. Respiratory system (state of respiratory muscles, mode of breathing).
   2. Vocalization system (state of vocal ligaments, vocal delivery, articulation)
   3. Soft palate (presence and type of pareses, hyperkineses).
   4. Lingual muscles (localization of pareses and hyperkineses).
   5. Teeth (structure).
   6. Lips (type of pareses and hyperkineses).
   7. Structure of synchronism present in articulatory system in the formation of the speech flow.

G. ***Emphatic speech.***
   1. Understanding of direct speech (a) in the broad sense (conversations about material in books geared to the child's age); (b) in narrowly situational contexts (conversations about routine activities, the names of clothing items and household furniture).
   2. Receptive vocabulary (naming real objects or objects pictured on cards; emphasis placed on the use of verbs, adverbs, and auxiliary parts of speech).
   3. Understanding prepositional relations (understanding and ability to use prepositions in contexts geared to the child's age).
   4. Understanding inflectional relations (capability of producing grammatical agreement between words in a sentence).

H. ***Expressive speech.***
   1. Characteristics of independent speech (extent to which speech is expanded or nonexpanded; grammatical structure).
   2. Acoustic structure of speech (speech pattern).

I. ***The child's cognitive activity.***
   1. Stereognosis (determining objects by means of touch): (a) texture, measured by a set of different pieces of material of the same size, e.g., wooden, glass, and metal blocks; (b) shapes of real objects (magic bag technique as in Figure 1); (c) differentiating between geometric figures in terms of shape, size, and thickness (Figure 2).
   2. Visual perception. (a) color; (b) shape, size, and thickness.
   3. Spatial imagination. (a) orienting oneself to one's own body and opposite someone in a sitting position (Figure 3); (b) differentiating between the spatial concepts of above – below, nearer – farther, to the right – to the left, in front of – in back of (Figure 4); (c) remembering the relative positions of objects in space (Figure 5); (d) constructional praxis (Figure 6).

4. Temporal imagination (determining the temporal sequence of events and verifying one's own understanding of the number of actions and events that could occur in a unit of time).
5. Quantitative imagination (performing arithmetic operations, selected with respect to the child's age).
6. Ability to analyze, synthesize, and switch attention as measured by exercises using series of pictures, the "odd item out" technique (in which the child is asked to discard one of four items), syllogisms, and efforts to find logical connections.
7. Characteristics of attention (span, adaptability, persistence).

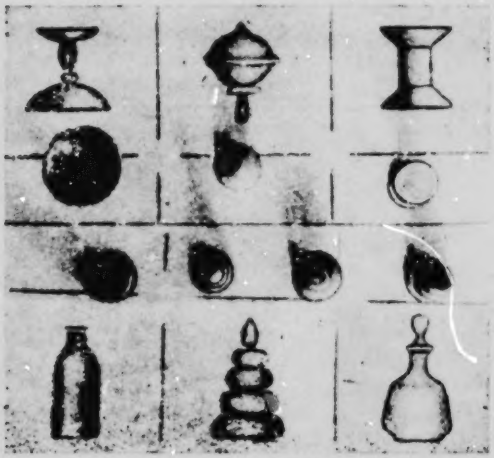

Figure 1. Distinguishing between real objects. The magic bag technique.

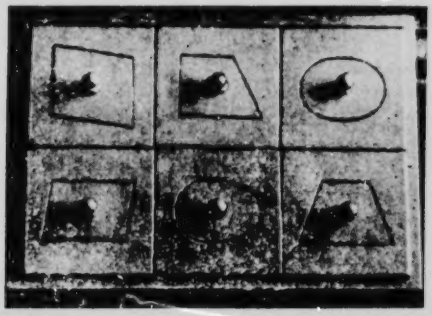

Figure 2. Distinquishing between geometric shapes

Figure 3. Orientation relative to one's own body and opposite someone in a sitting position. The Simon Says technique.

Figure 4. Distinguishing between the spatial concepts of above–below, nearer–farther, to the right–to the left, in front of–in back of. (Determining the relative position of different objects.)

Figure 5. Set of objects for improving memory of spatial relationships. (left) for children 5–7 years of age; (right) for children 7–10 years of age.

J. ***Conclusion: Diagnosis. Program of psychological and speech therapy measures.***

In selecting the different tests for studying cognitive activity, the child's age, along with the possibility of motor impairments to his hands and defects in articulatory speech, should be taken into account.

Let us now review results obtained from examining children one, seven, and ten years of age using this system. These age levels were selected to illustrate various elements of the child's intellectual and verbal development in the infant stage, in the pre-school period before the child has been subjected to the curriculum of the general educational school, and at the conclusion of the elementary school period. Note that the ten-year-old child has been educated according to the ordinary public school curriculum, though there has been no remediation of his cognitive activity or speech prior to the examination.

Psychological and Speech Therapy Examination Chart

Zhena C., 11.5 months old

Diagnosis, concomitant illnesses, state of hearing and vision. Diplegia, convergent squint. Spasmodic dysarthria.

Medical history. Parents healthy, at time of birth mother was 24, father 27. The child is from the first pregnancy, which was accompanied by severe toxicosis; in the third month of pregnancy, the mother contracted a flu with high temperatures. Born at full term, no birth activity, long forceps were

used; the infant was born in asphyxia livida; resuscitation took 35 minutes. At birth, the infant weighted 3400 g, and was 51 cm long. She remained in a clinic until two months of age, did not take to breast and instead was fed with formula; additional food was provided during weaning after the second month. During the suckling period, the infant often choked, and there was no feeding reflex when she was held in the nursing position. The infant was flaccid, and did not begin to focus her eyes on objects until the fifth month; at six months of age she smiled when a grown-up appeared or when presented with a bright toy, at eight months of age, she began to distinguish relatives from strangers, and at ten months of age, she began to reach out to playthings. At this point she had already focused her attention on the tone of voice of whoever was speaking with her.

The child's motor capacities. Prior to the examination, the child was unable to turn over on her back on her own, did not sit up, and could not hold up her head. Asymmetric and symmetric tonic neck reflexes were not present. The child choked on liquid food, and did not eat from a spoon. She reached out to playthings, but did not hold them in her hands.

Emotional and volitional domains. Amimic face, indifferent to surroundings. Though she recognizes relatives (smiles), there is no "state of animation" present. No mimicry responses noted; she does not carry out actions to command. She does not respond to the sound of her name, nor does she associate a word with an object or action. Begins to make sounds.

State of articulatory system. (a) When making sounds or crying, the abdominal muscles that create the respiratory stream are not stretched to the same extent on either side, but instead tend more towards the left; (b) the soft palate contracts flaccidly, and is deflected to the right; (c) the tongue is heavy and clumsy, or "mappy"; (d) there are no teeth; (e) lips are flaccid; the child is unable to close them fully; she cannot stretch them apart to make sounds in a tube nor can she hold the nipple of her bottle.

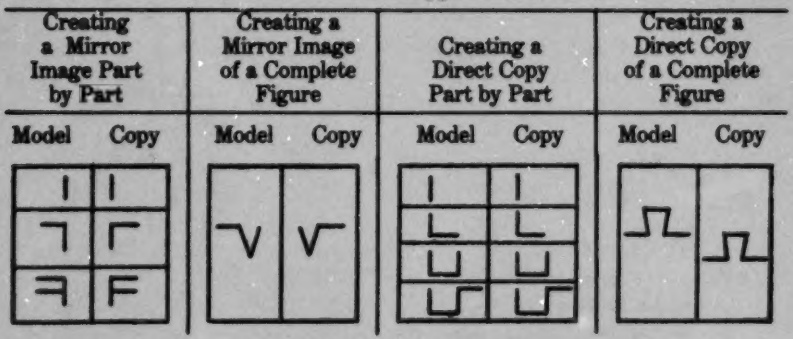

Figure 6. Examples of constructional praxis (see text).

Structure of synchronism in articulatory system in the course of creating the flow of speech is impaired. The child cries and makes sounds only intermittently, and chokes since the supply of the respiratory stream is not synchronized with the state of the vocal cords, nor does the vocal and respiratory stream correspond to the contraction of the soft palate.

Understanding of direct speech. The child does not understand direct speech, nor does she respond to the sound of her name, and does not relate an object and the word denoting it. Expressive speech is absent, and nasalization is observed when making sounds.

Conclusion. At 11.5 months of age, the cerebral palsied child is far behind the normal child in terms of the development of the sensory and motor domains. Similarly, the child's speech-impellent and speech-receptive systems are not ready for the production of speech acts. Consequently, specialized psychological and speech-corrective steps intended to overcome these impairments are recommended.

Psychological and Speech Therapy Examination Chart

Sasha B., seven years of age

Diagnosis, concomitant illnesses, state of hearing and vision. Double choreoathetosis, neuritis of acoustic nerves, convergent squint. Hyperkinetic dysarthria.

Medical history. The child is from the third pregnancy; a healthy boy was born from the first pregnancy, while the second pregnancy ended in miscarriage. The mother's rhesus factor is negative. The third pregnancy was normal, birth occurred at full term, and the infant weighed 4200 g upon birth and was 52 cm long. After two hours, the newborn developed hemolytic jaundice. Artificial feeding was maintained. Subsequently, the mental and motor functions lagged behind. The child did not sit up without stays until four years of age, and did not walk until he was five. He understood direct speech from age two, and began to pronounce individual words by the age of three.

The child's motor capabilities. The boy walks on his own, though holds his head up poorly; the neck tonic reflex and dystonia musculorum deformans (Ziehen-Oppenheim disease) are sharply pronounced. He dresses himself on his own, but is unable to button up or tie his laces without help. He eats solid food on his own, but not soup, though he drinks from a cup. Because of highly pronounced hyperkineses, he is unable to write or draw. Hyperkineses intensify when he attempts to undertake an activity, at which point gross synkineses appear.

Emotional and volitional domains. The emotional and volitional domains are labile, the child's state veering between tearfulness, euphoria, and impulsiveness without the desire to do things; abulia is noted. He does not

properly realize the seriousness of his condition. The boy believes his motor impairment is slight, does not notice the defects in articulatory speech, and is of the opinion that he performs all his tasks (drawing, writing, story-telling) correctly and splendidly.

State of articulatory system. (a) Breathing is shallow and clavicular; hyperkineses in the respiratory muscles markedly intensify when attempting to speak; the respiratory stream is intermittent and uncontrolled; (b) vocal delivery hypophonic; the closure of the vocal cords is not synchronized with the arrival of the respiratory stream, as a result of which the voice has an intermittent, uneven quality to it, and periodically fades away; (c) the soft palate is continuously twitching; and the passageway to the nasal cavity is periodically open, which imparts a nasal quality to speech; (d) the athetoidal component is also intensified in the tongue when the child attempts to speak, and is particularly expressed at the terminus of the tongue; (e) the teeth are spread apart, and prognathous; (f) hyperkinesis of the lips is sharply pronounced even in a state of rest; it intensifies when the child attempts to speak and continues throughout the speech act.

Structure of synchronism in articulatory system in formation of the speech flow. The speech flow is accompanied by marked asynchronism of all the organs involved in the act of speech. The arrival of the respiratory stream is not synchronized with the closure of the vocal cords, and vocal delivery is accompanied by athetoidal movements of the soft palate, tongue, and orbicular muscle of the mouth. Speech is uneven as a result, occasionally fading away and accompanied by a nasal twang, causing unclear pronunciation of all sounds.

Understanding of direct speech is limited. Vocabulary lags far behind. The child does not recognize the meaning of a number of prepositions and adverbs that define temporal and spatial relationships, and also does not understand the meaning of the nouns that denote abstract and generalized concepts.

In expressive speech, all sounds, particularly vowels, are distorted, and there are no consonants. The voice is uneven, intermittent, with a nasal twang. There is no intonation to speech, pauses occur in the middle of words and the rate of speech is slowed down.

Cognitive activity. Stereognosis in the recognition of surface texture and in differentiating between geometric forms is impaired in both hands. The ability to distinguish real shapes is greatest in the left hand. Figure 7 shows how the child depicts geometric bodies after having touched them first with his left, and then with his right hand. On the left are the original geometric shapes.

Color perception is normal; the child correctly distinguishes round and angular shapes, but makes mistakes when presented with different types of polygons; attention is not sustained.

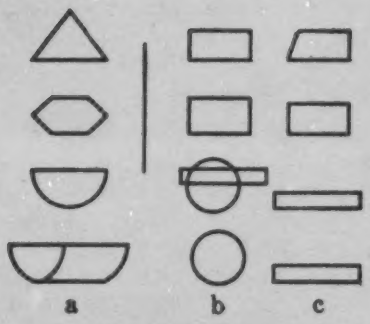

Figure 7. Graphical representation of geometric shapes (a) felt with the right hand (b) and left hand (c). (Sasha B.)

Spatial imagination. Right-left body orientation is retained, but mistakes are made in body orientation relative to a seated person. Given four parts that form some figure, he is unable to put them together to form the whole, nor can he perform tasks according to the Kohs technique. There are serious errors in his constructional praxis exercises.

Temporal imagination. The child does not grasp the temporal sequences in the alternation of the seasons and months of the year, nor can he correctly determine the number of events completed in an hour, day, week, month, or year.

Ability to analyze, synthesize, generalize, and shift set. Analytic and synthetic abilities as demonstrated by means of the "odd item out" technique and in responses using Wechsler tests geared to the child's age are significantly retarded and completed only with great difficulty.

Memory and attention. Attention is not sustained, its span is contracted, and the child finds it difficult to shift his attention. Figure 8 shows how Sasha B. reproduces the relative position of three objects from memory.

Conclusion. Retardation of verbal and intellectual development. Hyperkinetic dysarthria. Lessons with a speech therapist using a special technique and work in a remedial program in kindergarten are recommended.

Figure 8. Developing memory of the relative spatial positions of objects (Sasha B.). (a) original position of the objects; (b) reproduced position of the same objects.

Psychological and Speech Therapy Examination Chart

Kolya Z., 10 years of age.

Diagnosis, concomitant illnesses, state of hearing and vision. Diplegia, choreoathetosis, right-side neuritis of the acoustic nerve. Spasmodic hyperkinetic dysarthria.

Medical history. Child from the eighth pregnancy; the preceding pregnancies terminated in miscarriage (following the birth of the child, toxoplasmosis was established in the mother). The boy was born premature in the seventh month, weighed 1400 g upon birth, and was 48 cm long. The infant did not take to breast, drank formula, and gulped in the course of suckling. He was irritable, slept little before he was one, and cried for hours on end. At the fourth month, he began to smile when grown-ups appeared or when presented with bright playthings, began to focus his eyes on objects in the fifth month, and reached out towards playthings at one year of age. At this time, he began to recognize relatives and focus his attention at the tone of a voice. He could sit up at two and a half, and walk at five, using orthopedic footwear and crutches. He understood direct speech at two years of age, and spoke at four years of age. During his first, second, and third grades, he studied at home; from the age of eight, his studies followed the curriculum of a general educational school.

The child's motor capabilities. The boy walks on his own with therapeutic equipment and crutches and can take care of himself, but at a greatly reduced pace. He finds it particularly difficult to button up and lace his boots. He writes in large letters, illegibly, and very slowly. Hyperkineses are noted when he attempts to speak, though they are not sharply pronounced.

Emotional and volitional domains. The child is asthenic, with slow responses, tires rapidly, and is unaware of his disability.

State of articulatory system. (a) Breathing is shallow and clavicular, and the respiratory stream weak; (b) vocal delivery is hypophonic, at times the voice fades away, with a falling intonation; (c) the soft palate is tensed, and does not contract sufficiently; (d) tongue tension is quite high, and the tongue itself is thick and unwieldy; (e) the teeth are carious, though without structural pathology; (f) the lips are flaccid, the boy is able to purse his lips but cannot raise his upper lip or drop his lower lip separately; there is hyperkinesis of the orbicular muscle of the mouth.

Structure of synchronism in articulatory system in formation of speech flow. The delivery of the respiratory stream is not always synchronized with the closing of the vocal cords, and thus the voice periodically falls off.

The boy's understanding of direct speech lags far behind his age level. His vocabulary does not reflect the curriculum material covered. He does not know specialized terms and has a poor understanding of words that denote spatial and temporal relationships and abstract concepts.

In expressive speech all sounds are distorted; the groove sibilants are particularly affected. There are no flat sibilants nor voiced consonants, and the "r" and "l" are also absent. The boy's speech has a nasal quality to it.

Cognitive activity. Stereognosis in the differentiation of geometric shapes is impaired in both hands. Visual perception of color and shape is normal.

Spatial imagination. Given six parts forming some figure, he is unable to put them together to form the whole, nor can he complete tasks according to the Kohs technique. There are serious mistakes in the mirror images he creates, and isolated errors in direct copies of complete figures (Figure 9). He is unable to complete plans and diagrams he is asked to draw as part of the curriculum.

Temporal imagination. The concept of a "century" is not formed. He lacks the notion of the temporal sequence of events which he has studied.

Ability to analyze, synthesize, generalize, and switch attention. Analysis and synthesis are significantly below his age level and do not reflect the curriculum covered. He has difficulty undertaking an analysis of passages after reading them.

Attention and memory. Attention is not sustained, and its span is contracted. The boy had difficulty shifting set; long-term memory and the recall of spatial relations are undeveloped.

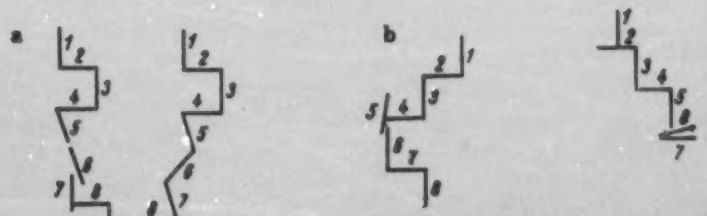

Figure 9. Examples of constructional praxis exercises (subject Kolya Z.) (a) copying an entire line drawing (direct trial); (b) drawing a mirror image, copying parts.

Conclusion. Retardation in verbal and intellectual development. Spasmodic-hyperkinetic dysarthria. Lessons with a speech therapist using a special technique and work in a remedial program in the third grade are recommended.

It is clear from the examination charts we have presented that impairment and underdevelopment of the child's cognitive activity and speech may be found as early as the pre-verbal period and do not improve spontaneously. Consequently, differences between the intellectual and verbal development of children with cerebral palsy and normal children are quite apparent at different age levels. In the next chapter we will follow up these differences in detail.

CHAPTER III: COMPARISON OF COGNITIVE AND VERBAL DEVELOPMENT IN THE NORMAL CHILD AND CEREBRAL PALSIED CHILD FROM ONE MONTH TO SEVEN YEARS OF AGE

It has already been noted that simultaneous impairment of cognitive activity and the motor function leads to improper development of the psychomotor and verbal spheres from the moment of birth. By means of a correct diagnosis of these disabilities at the different age levels, it is possible to make an early decision as to a set of remedial measures. In our comparison of different aspects of the development of the normal and cerebral palsied child, we have relied on relevant published data on the development of the normal child presented by various writers on this topic (N. A. Menchinskaya, 1941; R. Ya. Abramovich-Lekhtman, 1946; N. L. Figurin and M. P. Denisova, 1949; R. F. Gorchakova, 1958; M. M. Kol'tsova, 1958; F. N. Shemyakin, 1959; D. B. El'konin, 1960; A. A. Lyublinskaya, 1971).

Let us consider the various aspects of the psychomotor and verbal development of the normal child and cerebral palsied child at successive age levels. We first present a description of children at the nursery level (from birth to three years of age).

Four weeks (1 month). The normal infant clenches his forelimb in a fist, often with his lips and sucks easily. A sucking reflex is observed when he is held in the breast-feeding position. When lying on his stomach, the baby reflexively turns his head to the side, half closes his eyes when placed in bright light, turns his head to the light, tries to lift and hold his head up, and again lies on his stomach. The infant produces gentle sounds. Blinking of the eyelids in response to auditory stimuli is noted. The infant sometimes attends carefully to speech sounds and to singing. The first smile in response to adult talk is observed.

In the cerebral palsied infant, the palms are spread apart or the fingers just slightly bent. There is no sucking reflex when in the nursing position. The synchronism between breathing and sucking movements breaks down, and the infant chokes in the course of sucking. Where there is a unilateral lesion, it is noted that in crying or shouting the two sides of the infant's face do not participate to equal degrees. When lying on his stomach, the infant does not turn his head and eyes towards light. He does not focus his eyes on objects, nor does he concentrate his attention on bright and shiny objects.

16 weeks (four months). By this time in the normal child, the constitutional hypertension of the newborn infant has disappeared. The infant lies on his stomach for several minutes leaning on his forearm, and holds his head up well. A crawling reflex is seen; the infant produces a physiological bridge through the arrangement of the position of his stomach relative to his back. In this posture, the infant explores his forelimb, holds his head up straight, and after several minutes is able to sit down using stays. While supported under the arm, he leans against his mother's knees with his legs, which he

bends at the hip joints. The length of time the infant is awake increases significantly. The infant begins to show interest in the world around him, and will focus his eyes on the face of a grown-up leaning upright near him on his hands. In response to the sound of talking, he shows joy by means of a smile, various sounds, and lively motions of his hands and feet in a state of animation. With his hands, the infant haphazardly pushes against playthings hanging above his chest. Upon hearing sounds, he will look for an object outside his field of vision, and will turn his head towards the source of the sounds. He smiles often when awake, produces loud sounds, and bends and straightens out his hands and feet. The infant examines, feels, and grasps at playthings hanging above his chest. While feeding, he tries to hold his bottle in his hands.

In the cerebral palsied child, intensification of constitutional hypertension is observed in this period, along with an increase in the tension of the thigh abductors and shin extensors. The grasping reflex is absent. The infant does not reach out to playthings, does not hold his head up, and lies passively. He is unable to master static body positions, nor can he sit up, falling either on his side or back. He does not exhibit a crawling reflex, and cannot sit up using stays. If the infant is held under the arm, he does not search for a support; his legs end up in a "scizzors" posture or hang twisted as in a braid. The lengths of his wakefulness and sleep periods do not correspond to his age; either he sleeps far too much or far too little. The infant is indifferent to his surroundings nor does he respond to the appearance of grown-ups. His face is amimic; salivation is observed as well as difficulty in sucking and swallowing. He does not show any interest in playthings. No animation state is observed. He rarely smiles, and when he does his smile is reflexive in nature without any emotional tone to it. During the solid feeding period, he continues to choke on liquid food. His hands remain passive during feeding.

24 weeks (6 months). In the normal child, a symmetric tonic neck reflex is observed by the sixth month; that is, the tension of the muscles of the arms and legs changes with the movement of the head. The reflex vanishes by the sixth month. The infant can already turn over from his stomach to his back, move about in his crib either by crawling a bit or using his hands, and has no trouble eating from a spoon. He can lie for long periods of time on his stomach, raising himself slightly by leaning on his hands and knees. The infant distinguishes between relatives and strangers, responding in different ways to them. He distinguishes the intonation of voices directed to him and makes sounds for long periods of time. Individual syllables appear. He takes his rattle in his hands and holds it for some time.

In the cerebral palsied child, asymmetric and symmetric tonic neck reflexes are highly pronounced, and show no signs of attenuation by the time the crawling period begins. The infant is unable to turn over from his stomach to his back, or the other way around. As before, he chokes on liquid food, and does not eat from a spoon. When lying on his stomach he is unable to lift himself using his hands and knees. He does not show interest in rela-

tives, nor does he attend to the intonation of voices. He rarely makes any sounds and never produces baby-talk.

7 months. The normal child handles playthings, moving them from one hand to the other, makes noise by banging his toys together or dropping them on the floor, eats when he is happy, and shows interest in solid food. He learns how to clap his hands together to make a sound and how to make the sign for "bye, bye."

The cerebral palsied child cannot turn over on his back on his own, in general either does not sit up at all or can sit up using stays only for short periods of time. The infant is not interested in playthings, and is indifferent to his surroundings. There is no interest in solid food. The infant is unable to hold his head up.

8 months. The normal child will sit up and lie down on his own, try to stand up leaning with his hands against the back of the bed or edge of the crib. He will eat small pieces of bread and drink from a cup held by a grown-up. The child pronounces various syllables loudly and repeatedly. If a grown-up asks him to, he will undertake various movements, for example in response to such requests as "Clap you hands," "Give me your hand," and "Bye bye." He gets involved with playthings for long periods of time, examines them, and bangs them against each other.

The cerebral palsied child cannot drink from a cup. Only at this age does he begin dinstinguishing relatives from strangers, and move towards playthings, but does not reach out to them. He does not engage in any mimicry. He starts to make sounds.

9 months. The normal child tries to walk by holding onto objects with his hands. He drinks from a cup on his own, and holds it himself. The child knows his own name, and turns around when it is called out. In response to the question, "Where?", he will hunt for several objects without any regard for their actual position. He handles objects in different ways, depending on their properties, for example, rolling balls, taking one object out of another, and squeezing and releasing rubber toys. At this stage, the child utters his first words ("mama," "papa," "grand-ma").

The cerebral palsied child has yet to learn how to assume static positions, nor does he respond to his own name. He does not connect a word with an object or action. He takes playthings into his hands, but does not play with them in accordance with their properties, that is, he doesn't roll a ball, or squeeze and release rubber toys.

10 months. The normal child mimics grown-ups, and repeats various sounds and syllables grown-ups have uttered in his presence. At the request of a grown-up ("Give me the ball," "Give me the doll"), he will locate and hand over toys. The child joins in such games as "cuckoo bird" and "magpie-crow" satisfactorily. He handles objects; such actions as pulling out objects and pushing them in assume the nature of routine habits.

In the cerebral palsied child, no mimicking responses are observed, nor

is there a proper response to direct speech. Partial amimicity of the face is seen in the case of unilateral lesions, and the child can reach out to objects only with one hand at a time.

11 months. The healthy child utters his first meaningful baby-talk ("av-av," "kis-kis," "mu-mu"). Certain words are extraordinarily overgeneralized; for example, in response to the question, "Where is the kitty cat?" he may point to a cat, fur hat, etc. At a grown-up's request, he will perform different actions with objects, and can point to parts of his body and various clothing he is wearing.

In the cerebral palsied child, meaningless baby-talk is heard when he makes sounds. He only now begins to recognize relatives, but is unable to carry out actions when requested to do so by a grown-up.

12 months. The normal child walks on is own with legs spread apart in an unsteady gait. The child holds a spoon properly, places small objects on his fingers, and will climb down from a chair or couch and go around obstacles to reach his playthings. In the course of eating, he is active, and tries to hold his spoon by himself. At this age, the child begins to make his first constructions, for example, putting one of his building blocks on top of another. He has no trouble mimicking the sound of new words, and pronounces about 10 words; his stock of words increases gradually.

The cerebral palsied child cannot eat on his own, is indifferent towards food, and continues to choke on liquid food. He sorts his building blocks in a meaningless fashion, and is unable to create constructions.

18 months (1.5 years). The normal child walks on his own, clambers down the staircase step by step, throws his playthings around, and picks them up. He "draws," clenching the pencil in his fist, turns pages in picture books, helps out in getting dressed and undressed, sits down on small stools on his own, and drinks from a cup, holding it with both hands. His speech is unclear, consisting in baby-talk. He loves to converse with grown-ups, and sometimes speaks to inanimate objects. Visual perception of color and shape has been formed; he distinguishes the basic colors of the spectrum by analogy, and differentiates between shapes, for example, a ball and a brick, by analogy.

The cerebral palsied child does not walk, and can stand up only with the aid of stays. He does not lean firmly against the support. He is unable to sit down on a stool on his own, neither does he drink from a cup. He does not help out in getting dressed and undressed. He expresses his desires by crying out and does not utter any baby-talk. He does not distinguish colors, even in terms of analogy; his visual perception of shape also remains undeveloped, and he is unable to distinguish between a ball and a brick, for example.

Two years. The normal child runs about, and is able to climb up and down the staircase. He holds his cup with one hand, and can open and close doors on his own. It is at this time that he acquires a sense of orderliness. The child may engage in such games as "feed the doll" and "hide the toy," and

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assembles and disassembles pyramids and matreshkis.* He makes a collection of three or four toys, and knows and can identify by name three or four colors. The child recognizes the sounds of domestic pets and can mimic these sounds. He enjoys playing with other children.

The cerebral palsied child does not walk, nor does he play with other children. He is unable to walk up and down staircases even using stays. He cannot hold a cup in his hands, nor open doors. He is not always able to differentiate colors even by analogy. He does not distinguish animal sounds, nor mimic these sounds. The child does not engage in thematic games.

As is clear from the foregoing material, psychomotor retardation is observed in the cerebral palsied child as early as the first month of life, and becomes especially noticeable by the fourth month. By one year of age, the child is not ready to learn how to assume a standing position, and exhibits severely limited sensory capabilities. By three years of age, this gap in development has increased, since it is at this point that the normal child is walking and has learned to speak. Let us now attempt to describe the development of the normal child and cerebral palsied child at the age of three.

In the normal child, the motor function is by this point already highly developed; the child is able to stand on one foot for some time. Differentiated coordinated motions have also developed by this age. He can throw a ball up in the air and catch it, and ride a tricycle. He draws toy houses and cars, holding the pencil in one hand, and turns the pages in a book one at a time. The child eats on his own, but is clumsy and needs some help in getting dressed and undressed.

The cerebral palsied child can walk only if assisted. His motor coordination is inadequate; he can throw a ball up in the air but will let it fall on the ground. He cannot ride a tricycle. He cannot eat without assistance, and draws only haphazard lines. He cannot get dressed or undressed on his own.

Visual perception has formed in the normal child. By this age, he has learned to distinguish the basic colors of the spectrum and knows the names of three or four of them. The concept of shape has become increasingly significant for the three-year-old child; he is able to differentiate between round and angular figures. He is capable of perceiving the outlines of familiar objects, and can relate a word and the object that it denotes. He refers to a familiar object by its proper name, and in doing so distinguishes certain features of the object. In the cerebral palsied child, perceptions are contextually defined and become blurred, merging into vague generalities. There is also an inability to differentiate between perceptions. If shown a card with a picture of a tiger on it, he may call out "cat." Perception itself depends on past experience. The child does not distinguish individual objects on picture cards and confuses their names. He has difficulty selecting objects by analogy, and

* Russian dolls that, when taken apart, fit one inside the other (Trans.).

in his selection often relies on the color of the figure.

In the normal child, the apprehension of the relative position of an object in space merges with the perception of the content of the object itself; if this context is altered, the object's reference points must be explained to the child a second time. At this stage in his life, the child identifies the different directions in space (up, down, forward, backward) correctly, and can undertake movements in these directions when told to do so. The child begins to orient himself to his body schema. By contrast, the cerebral palsied child in unable to identify the basic directions in space, and does not orient himself to his body schema. Similarly, he cannot perform movements when asked to do so.

The normal child can relate temporal concepts, determine the sequences in the order of routine events, and is able to distinguish night and day. The cerebral palsied child is unable to recognize the different periods of day, nor can he grasp the order of routine events.

The normal child recalls verbal instructions. That is, when undertaking routine tasks he will rely on his memory. Through practical cognitive activity, his memory has been freed from dependence on perception. Instead, reproductions are formed involuntarily once they have been made manifest through suggestions made by grown-ups. Voluntary reproductions become distinct impressions in motor memory; thus, the child orients himself in space with respect to familiar surroundings. The ability to recall stories and poetry which have been read to him begins to appear.

Recollection and the creation of reproductions from visual models assume dominant roles in the cerebral palsied child. In recalling new words, he does not always relate them to their meanings. Motor memory is poorly developed. He does not recall poems and stories even after hearing them repeatedly.

In the normal child, the level of generalization is a function of experience. He begins to compare objects and events in terms of some general or self-evident attribute. The ability to make primitive (though superficial) judgements and deductions begins to appear. The child is not yet able to distinguish essential attributes, though he grasps accidental attributes. He relies on complete concrete images and discriminates only the most salient attributes of objects. His speech consists of short sentences.

The level of generalization displayed by the cerebral palsied child is low due to his lack of experience. The ability to make comparisons and analogies remains undeveloped; the child is unable to discriminate even accidental attributes. His speech consists of isolated words of baby-talk.

From our comparison of the development of the normal and cerebral palsied child at this point in their lives, it is quite clear there now exist factors that will cause children suffering from cerebral palsy to lag behind in their ability to form generalizations. Let us now consider the development of the normal child and the cerebral palsied child in their fourth year.

In the normal child, mobility is significantly developed. He walks easily, runs around quite a bit, and knows how to undertake movements at a specified pace, and how to restrain his movements when asked to do so. He has also learned to ski. The child dresses, undresses, and eats on his own. Manual dexterity in games with various objects has developed; for example, he makes things out of building blocks, makes castles out of sand, and so on. By contrast, the motor capabilities of the cerebral palsied child are severely limited. He walks with difficulty, often by means of prostheses, leaning on a stick or crutches. He is unable to get dressed and undressed on his own, and eats only with the assistance of grown-ups. His manual dexterity remains significantly underdeveloped.

The perceptual ability of the normal child has become differentiated. Representations of the basic colors of the spectrum have already been formed. Contrasting geometric forms, such as circles, squares, spheres, and cubes are correctly distinguished by analogy, and spheres and cubes even by name. The cerebral palsied child is confused about the basic colors and shapes of objects in terms of denotation and cannot distinguish them by analogy.

Spatial perception in the normal child has become more sophisticated. He perceives the spatial orientation of objects (to the right, to the left, over, under, on top of, towards); he is also able to compare objects in terms of length, width, and height. Given three parts forming some object, he can put them together to form a whole, and creates structures using building blocks or parts from an erector set, based on pictures shown to him. In the cerebral palsied child, differentiation of spatial trace imagery lags; the child is unable to perceive the attributes of objects.

The normal child apprehends the passage of time, and is able to distinguish morning, daytime, evening, and night. The cerebral palsied child can distinguish between night and day, but cannot tell when it is morning or evening.

In the normal child, expressive speech is in the form of grammatically and syntactically correct sentences; he becomes tongue-tied only if asked to pronounce flat sibilants or sonorous sounds. The cerebral palsied child exhibits a marked lag in the development of receptive and expressive vocabulary, and has particular difficulty with prepositional relations. Nouns predominate in his expressive speech, verbs occur more rarely, while adjectives and auxiliary parts of speech are almost never used. Sentences are short, and are not always syntactically well-formed.

The normal child is actively involved in the development of skills of manual dexterity. He knows how to correctly hold a pencil, and if asked to do so, will draw vertical and horizontal lines. He will use both curved and straight lines in his drawings. On his own, he will color objects, and draw quadrangles, squares, and circles. He also works with paint. The cerebral palsied child can draw only isolated strokes which lack any representational

content, and has difficulty holding a pencil.

For the normal child, accidental external relations still play a significant role in recollection. In recounting a story or tale, he does not convey the sense of what he has read, but instead will retell it word for word. In the area of memory, we see at this age the first attempts at relying on meaningful relations between objects, for example, through the analysis of the content of picture cards. Recollection occurs without forethought, principally in the course of playful activity. Memory is primarily graphical and visual in nature. The memory of the cerebral palsied child differs in certain respects; for example, his recollections are determined by accidental external attributes, and only mechanical recall is well developed.

The normal child begins to attempt to group together objects in terms of their functions, thus gaining experience in classification. He strives to establish causal relations between events, often turning to grown-ups with such questions as, "Why?" "What is that for?" "For what reason?" The cerebral palsied child does not attempt to combine objects in terms of meaningful relations, and finds it difficult to make generalizations. Questions such as "For what reason?" and "What is that for?" are asked only when he is much older.

Quantitative representations have developed in the normal child. He is able to distinguish between contrasting concepts, such as many–few and one – two – three. He can correctly identify groups with the same number of uniform elements. In the cerebral palsied child, the concepts of many–few have also been formed, though the numerical concepts one–two – three have yet to be learned.

From the foregoing discussion, it is clear how imperfect is the cerebral palsied child's mastery of such functions as perception, imagination, memory, and the ability to make generalizations and undertake arithmetic operations. Let us now outline the developmental characteristics of the fifth year.

In the normal child, we observe well-coordinated movements of the hands and legs in the course of which the child maintains the proper bearing. The child knows how to stop walking at a given signal, and is able to crawl on a log lying either flat or at an inclined angle. He can ride a tricycle or bicycle, and is beginning to learn how to skate.

In the cerebral palsied child, static and dynamic functions depend upon the severity and type of affliction. In infantile cerebral palsy of average severity, the child begins to walk on his own only at the age of five, but is unable to undertake more complicated movements.

The normal child can name all the colors of the spectrum. He can compare objects in terms of size and arrange them in increasing and decreasing order with respect to length, height, and width. He begins to recognize and identify objects as being round, rectangular, or triangular, and can select different geometric shapes by means of analogy. The normal child exhibits stereognostic perception, correctly recognizing texture, identifying geome-

tric shapes, and distinguishing between plane and solid figures.

The cerebral palsied child can name only four or five colors (red, blue, white, black, green). The concepts of size (wider–narrower, longer–shorter) have not yet been acquired; the child is able to distinguish round and angular shapes only. Gross astereognosis is observed, expressed even in the healthy hand in 60% of all cases.

In the normal child, motor praxis has improved, to the extent that the child can mimic how a grown-up moves when in the standing position. He is able to correctly define the position of one object relative to another in space and, on his own, is able to verbally describe the position of an object. He can select parts of a structure in terms of shape, and compare them to each other. His construction process proceeds according to an internal plan. The child is able to relate parts with respect to color, shape, size, and quantity (up to four parameters). Constructional praxis has developed; thus he can directly copy parts or an entire model consisting of three or four sections. By means of pictures, he can convey round, oval, rectangular, and triangular shapes, as well as the structure of objects; he has learned to work with paint, and can draw thematic pictures.

In the cerebral palsied child, spatial imagination is grossly retarded in terms of development. The child is unable to mimic a grown-up's movements even when standing up. He finds it difficult or impossible to correctly relate an object in space and a verbal description of its relative position. He builds only from verbal instructions. He is unable to relate parts, for example, in terms of color, shape, and size simultaneously, and instead leans usually towards the attribute of color alone. He can copy directly no more than two or three parts; painting he finds virtually impossible.

The normal child's comprehension of temporal imagery has improved to the extent that he is now able to distinguish between the concepts of "yesterday," "today," and "tomorrow" without any error. The cerebral palsied child distinguishes only "night," day," and "morning," and is unaware of the succession of days.

At this age level, the normal child's memory span expands, and the accuracy and strength of recollection grow. The child begins to attentively consider material he has been asked to remember. Attempts at grouping together individual words and picture cards are noted. His process of recollection is successful if directed towards some goal. A lag in the development in intentional memory is noted in the cerebral palsied child. He is best at recalling stories and tales; that is, the effectiveness of his ability to recall events depends upon their emotional significance.

Besides generalizations based on external attributes, the normal child attempts to discriminate the most essential relations between objects, and groups objects together in terms of quantity and purpose. The ability to generalize develops further, and the child is able to eliminate the "odd" object

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from a group of four objects, though he is still unable to explain the reason for doing so. The comprehension of causal relations begins to form. The child understands what is shown on picture cards, and is able to enumerate actions, and discover meaningful relations. The cerebral palsied child has difficulty identifying essential relations, and is unable to complete the "odd item out" exercise. Basically, he grasps accidental relations.

The ability to form quantitative trace images is now exhibited by the normal child. He is able to call out numbers in sequence and compare two groups of objects. He knows how to count up to six, and can perform arithmetic operations with up to four numbers in sequence. The cerebral palsied child can perform arithmetic operations basically involving only two numbers at a time.

From the foregoing material, it is clear that retardation in the formation of the motor function and in cognitive activity brings with it an underdeveloped level of generalization. Let us now compare aspects of the development of the normal child and the cerebral palsied child at the age of six.

The normal child by now has learned how to make well-coordinated movements; for example, he can ride a bicycle, go skating, ski down small hills, go swimming, and hop on one leg. His expressive speech is clear; differentiated movements are observed in the articulatory system. Phonemic discrimination and analysis have been formed so as to assimilate instructional material on the subject of reading and writing.

The cerebral palsied child has still not acquired the motor habits needed for bicycle-riding, skating, or skiing, and cannot learn how to swim. Tongue-tied behavior is an aspect of his expressive speech. Pseudobulbar syndrome is often noted. Phonemic analysis has not been formed, and phonemic discrimination is grossly distorted.

The normal child correctly distinguishes and selects different plane and solid geometric shapes. He is able to relate the shape of actual objects with a given geometric shape, for example, which objects in a room are shaped like a square, circle, and so on. The cerebral palsied child, by contrast, makes errors when he tries to discriminate between geometric shapes, and is unable to relate the shape of actual objects with an abstract geometric shape.

The normal child correctly executes direct trials of constructional praxis and makes only isolated errors when he executes mirror image trials. He correctly executes tracing-out trials involving three elements. He can draw toy houses and tables on his own or by copying a model. Gross errors are observed in the cerebral palsied child's attempts at performing direct copying trials. He is unable to create mirror images, and makes errors consisting of two elements in the tracing-out trials. He is unable to create drawings on his own, and is rarely able to copy a model.

The expressive speech of the normal child is grammatically well-formed. His receptive and expressive vocabulary is adequate, and words occur in his

speech that generalize such temporal and spatial concepts as "earlier," "than," "nearer," "farther," and so on. He performs arithmetic operations with up to five numbers in sequence, and can count up to 10. In the cerebral palsied child, expressive speech consists basically of nouns, and is not grammatically well-formed. Passive and active vocabulary remains underdeveloped; his use of verbs, adjectives, and auxiliary parts of speech are affected particularly adversely. Such words are often absent from his flow of speech, and if they do occur, they are not always used properly. Basically, the child has yet to acquire generalizing concepts; further, his use of words related to these concepts is not always correct.

From an analysis of the foregoing discussion, it is clear that retardation in the development of cognitive activity and speech in the cerebral palsied child does not disappear spontaneously as the child grows up. On the contrary, these disabilities become increasingly more severe. In addition, because of a quantitative lag in the acquisition of new habits and new information, no one function can become more sophisticated through the addition of new qualities. Thus, the child is unable to execute mirror image trials, phonetic analysis remains underdeveloped, and so on.

At the age of seven, the normal child is studying at school. His phonemic discrimination and analysis, visual and spatial imagination, and receptive and expressive vocabulary have become sufficiently well-developed for the acquisition of instructional material. In the cerebral palsied child, we may observe impairments in the level of phonemic discrimination, a disability which makes it difficult for the child to learn how to read and write, and particularly hampers his ability to recognize relatives by the sound of phonemes (flat and groove sibilants, voiceless consonants, hard and soft phonemes, and also affricates). Difficulties in writing down letter combinations and even in the construction of isolated letters are found, and the child has trouble studying material in geometry. Tongue-tied behavior is retained in his expressive speech. Note, too, that vocabulary development continues to lag behind and that semantic distortions are present.

We undertook an experimental study of a number of forms of cognitive activity in 240 cerebral palsied children 7 to 15 years of age who were being instructed in accordance with the standard public school curriculum. Our study led to a number of conclusions regarding the development of afflicted children. For example, disturbances in stereognosis was noted in 197 of the subjects; interestingly, astereognosis was observed both in the afflicted hand (83%) and in the healthy hand (60%).

Astereognosis was apparent from such symptoms as (1) difficulties in determining the texture of objects (wool, silk, velvet, metal, wood, glass); (2) inability in determining shape of objects (hammer, small vase, spool); and (3) errors when attempting to determine the shape of different geometric forms.

In 78 of the children, defects in the visual perception of shape were also

observed. Typically, this defect was combined with disturbances in the stereognostic function, as well as impairments in spatial imagination; these impairments wre discovered in 198 (83%) of the subjects studied.

Our study of speech disorders revealed dysgraphia and dyslexia in 128 of the cerebral palsied children. In 70 of these children, defects in reading and writing could be attributed to disturbances in the visual perception of shape and in spatial imagination in conjunction with disorders in the stereognostic function.

Disturbances in temporal imagination were established in 65% of the children studied. The understanding of temporal sequences and ability to determine the number of events that could occur per unit of time were particularly affected.

From an analysis and comparison of the level of development of the vocabulary of the normal and cerebral palsied child, it was clear that 85% of the afflicted children suffered from a significant lack of vocabulary, which extended basically to words that denote spatial and temporal representations and generalizing concepts. Difficulties in the comprehension and use of adjectives, adverbs, and prepositions were rather acute in the cerebral palsied children. Defects in the articulation of speech sounds were exhibited by 75% of the subjects, basically involving impairments caused by the manifestation of different forms of dysarthria with varying degrees of severity. Moreover, in 60% of the children impairment to the function of the hands was observed. This disorder severely hampered the ability of these children to carry out graphical activities and also made it more difficult for them to take care of themselves.

Number of Children (hands) Studied	Disturbance in Stereognosis	Defects in Visual Perception	Impairment in Spatial Imagination	Underdevelopment in Temporal Imagination	Visual and Spatial Dysgraphia
240(480)	197 (336)	148	178	82	70

Table 1

Disturbances in Cognitive Activity Found in Experimental Study of Afflicted Children 7 to 12 Years of Age

It is clear from Table I that disturbances in cognitive activity are manifested, as a rule, organically. Thus, distortions in the visual perception of shape are always accompanied by astereognosis and underdevelopment of spatial imagination. Similarly, visual and spatial dysgraphia is based on poor visual perception and distortions in the stereognostic function and in spatial imagination.

Number of Children Studied	Lag in Passive Vocabulary	Lag in Active Vocabulary	Disturbances in Use and Understanding of Prepositions and Adverbs of Position and Time	Lack of Understanding and Absence in Speech of Words Denoting Generalizing Concepts
180	120	136	64	72

Table 2

Results of a Vocabulary Study in Children 5 to 10 Years of Age

From the data presented in Table 2, it is apparent that 66% of the afflicted children exhibit retardation in vocabulary development. The children find it particularly difficult to use and comprehend the meaning of words that denote spatial and temporal imagery, along with generalizing and abstracting categories.

The succeeding chapter will describe methods and techniques for remediation of the impairments we have described in the foregoing discussions.

CHAPTER IV: A PROGRAM OF PSYCHOLOGICAL AND SPEECH THERAPY EXERCISES FOR REHABILITATION OF CHILDREN SUFFERING FROM CEREBRAL PALSY

Rehabilitative Program for Use with Infants

We have undertaken efforts at the design of a program of rehabilitative exercises, drawing from several years of observation of the development of normal children and cerebral palsied children, and a review of the specialized literature. These techniques have been tested at the Mat' i ditya [Mother-Child] Department of the Turner Research Institute of Orthopedics and Traumatology and at the Komarovo Neuropsychiatric Sanatorium. We began by analyzing the mental and verbal development of cerebral palsied children who had received psychological treatment and speech therapy, as well as children in a control group who were not given any psychological or speech therapy. Children in the control group nevertheless received the same form of drug therapy and treatment by physical therapists as did children in the first group. From this analysis, it became clear that the cerebral palsied children in the control group exhibited significant retardation in their cognitive activity and speech. A special study we conducted [1972] made it clear that such drugs as cerebrolysine [hydrolysate of brain tissue] and gammalon [gamma-aminobutyric acid, GABA] do not produce adequate effects in the absence of psychological treatment and speech therapy. This conclusion was based on results of treatment trials conducted on 75 afflicted children using cerebrolysine and gammalon and trials on 75 children in a control group who were given the same drug therapy, though no lessons with a psychologist or speech therapist.

First year. In the newborn infant, it is necessary to develop the sensory processes (visual, auditory, tactile).

The infant is trained to look carefully at the face of a grown-up speaking to him, and to follow with his eyes brightly colored playthings. From the first month of life, the child learns to focus his eyes on immobile objects and then to follow them with his eyes as they are moved. It is desirable for the infant's mother, teacher, nurse and speech therapist to dress in bright clothing all of the same color. Efforts should be made to develop the infant's ability to listen to sounds produced in speech and singing, and the noise from playthings. A period of wakefulness following feeding is recommended. If pareses are discovered in the mimetic muscles, suitable stroking massages must be conducted, especially during bathing, and the prolapse angle of the mouth should be raised slightly from time to time. From the very first days, the mother should choose a nursing position that is most convenient for the newborn infant, and monitor his sucking process so as to minimize choking.

In the fourth month, the infant is taught to distinguish "relatives" from "strangers," and to turn his head at the sound of a rattle or when someone who cannot be seen calls out to him. It is necessary to regularly converse

with the infant, encourage noise-making and baby talk along with vocal responses, and to sing out vowel sounds ("aaa" and so on) with him. The infant's attention should be aroused when he is lying on the same side as his impaired limbs.

Efforts should also be made to determine whether the two halves of the infant's face are involved in crying, laughing, and eating to the same extent. Where there is asymmetric involvement, suitable massaging (stroking) of the paralyzed muscles should be performed several times a day.

Interaction with adults will increasingly create a joyful mood in the child and induce motor and verbal responses. The infant should be trained to hunt for particular objects with his eyes, and taught to find a plaything or some other object when at its usual spot; for example, at the age of seven months, in response to such questions as "Where is the doll?" or "Where is the clock?" At this stage, the infant is taught to make playful movements, such as clapping his hands or waving them to indicate "hello" or "goodbye". The teacher should increasingly involve the afflicted hand in the game.

From the age of six months on, the child's passive vocabulary develops apace. He is taught to point out the parts of his body, clothing, furniture, and routine household objects. Special emphasis is placed on his impaired limbs. For example, a toy may be placed in the afflicted hand, and the child asked to push and move it with this hand. These movements of the child's afflicted hand should be formed with the aid of the teacher's hand.

From the age of nine to 12 months of age, lessons designed to develop the child's passive vocabulary continue. The infant is taught to discriminate the names of grown-ups, words denoting parts of his body, clothing, and playthings, and is trained to respond to simple requests; he may be asked to open or close a small box, and place a toy in the box, and take apart and put together a matreshki. The infant learns to mimic the whistle of a steam engine and the mooing of a cow. At this time, intensive efforts should be made to improve his respiratory activity. The infant is taught how to blow out a lit candle, and to blow against wads of cotton wool, particles of fluff, and strips of multicolored tissue-paper attached to the railing of his crib right in front of his eyes. If the infant is still unable to sit up at this age because of his disability, it is essential that he spend his waking hours in a specially constructed chair equipped with a folding table.

Second year. Lessons intended to develop the child's emphatic speech (receptive vocabulary) continue. The child is given in detail the names of articles of clothing, furniture, dishware, and different plants and animals. Generalizing concepts dealing with clothing, furniture, animals, and playthings appear in his receptive and expressive vocabulary.

The child is taught to choose two basic colors by analogy, and to distinguish and choose sharply contrasting shapes (spheres, cubes, bricks) also by analogy. At this age, the child begins to assemble and take apart toy

pyramids. Spatial imagination develops, and construction activity begins to appear; different structures (e.g., gates, toy steam engines, staircases, furniture) are put together from toy bricks (Figure 10). This form of activity should be conducted using brightly colored toy bricks, with such colors as yellow, orange, green, and red predominating. Games designed to improve respiratory activity may be of various types, and may include inflating rubber toys and balls and blowing up soap bubbles. In addition, the child should be taught to mimic the cries of birds and animals.

Games that incorporate elements of play-acting are essential for the development of cognitive activity and for training the child in correct pronunciation. Here are several examples of these types of games: feeding the doll, putting the doll to sleep, mimicking the sound of a rooster, dog, small bird, and duck, and reading funny stories [*poteshka*]. To develop the child's ability at making generalizations, he may be asked to select three to five toys and match up paired picture cards.

While the child is engaged in manual activity, an effort should be made to ensure that he is using both hands, both the healthy and the impaired one. To enrich his vocabulary, a grown-up should express in verbal form all the actions and movements the child undertakes.

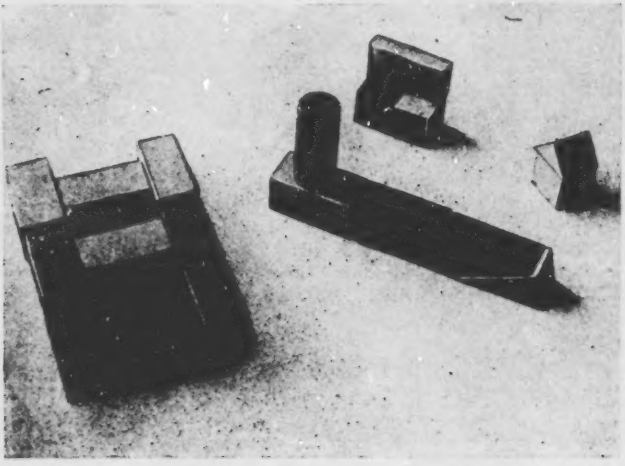

Figure 10. Constructions put together from building blocks (two years of age).

Third year. The child's ability to understand the speech of those around him continues to evolve. The child learns to recognize domestic pets and their young from picture cards, and gains an ability to observe and feed birds, and knows their names. He is also able to distinguish and correctly name plants,

certain vegetables (carrots, cucumbers, tomatoes), and fruit (apples, pears, oranges, etc.).

At this age, the child comprehends rather elaborate distinctions, determines objects from their outward appearance, and can identify several different types of transportation (private cars, trucks, buses, streetcars, trolley buses, sleighs), and name various parts of them (driver's compartment, steering wheel, running wheels, window, door).

Elements of dramatization are seen far more frequently in the child's games and the importance of manual activity grows. The child may play such games as "the doll is leaving the room," "let's give the doll a bath," and "who is eating what." The teacher should select games that help in the development of cognitive activity. For example:

(a) To develop the visual perception of shape and color – thematic lotto, moving colored (red, blue, yellow, green) balls around, magic bag game;

(b) To help in the formation of quantitative imagery – games involving trace images – such as many-few, many-one;

(c) To help in the determination of size and thickness – games involving plates and dishes, animals, and building blocks;

(d) To develop spatial imagination and attention – games such as Simon Says, matching paired picture cards, jigsaw picture puzzles (putting together a whole, given two parts), threading a ring out of laces, and passing a lace through a hole in a piece of cardboard.

Special emphasis is placed on the use of verbs. Exercises are selected to demonstrate the difference between perfective and imperfective cases.

Fourth year. The children are taught the correct names of different pieces of furniture and articles of personal use. At the age of four, the child should be able to identify and properly name the qualities of objects, vegetables, and berries (color, shape, taste, size).

At this age, he also begins to distinguish certain temporal and spatial concepts; words denoting these concepts (for example, "today," "tomorrow," "here," "there," "upwards," "downwards," "near," "far") appear. Trace images dealing with prepositional relations are formed at this time too. Lessons are conducted with the child to help him carry out actions that demonstrate his understanding of the prepositions "to," "on," and "above." Emphasis is placed on temporal sequences; the periods of the day are associated with particular routine events, for example, morning – breakfast; day time – dinner, games, strolls; evening – supper; night – sleep.

At this stage, manual dexterity develops apace. Children are given mechanical toys, learn how to assemble a tower from five or six rings, separate out large and small balls into two groups, put together various kinds of matreshki, small boxes, and balls, at first from three or four parts, and later on from five or six parts. The child should be able to put together a whole from four parts (blocks, jigsaw puzzle pictures), and be able to count

up to two or three. He is taught to identify and name the essential parts of certain objects, for example, in the case of a chair, its legs, back, and seat; in the case of clothing, sleeve and collar; and in the case of a jacket, its collar, sleeve, and buckle. The child should be able to identify similar objects in terms of their size, use, and name, for example, soup plate and dinner plate; tablespoon and teaspoon; cup and glass; chair, stool, and armchair; ordinary boots, shoes, felt boots, high overshoes, and galoshes. He is taught to identify and correctly name a host of spatial concepts, such as wide-narrow, low-high, long-short, as well as temporal concepts, such as the periods of the day (morning, evening, night). At this age, the young child should know his age, first and last names, and address. Note, too, that the perception of shape and spatial imagery develops in conjunction with elements of manual dexterity (drawing, rolling clay to form spheres, playing ball, doughnut rolls, tiny balls, etc.).

Set of Lessons for Preschool Children
(five to seven years of age)

Development of spatial imagination.

1. Identify the basic spatial (prepositional) relations using real objects. The child moves objects around in indicated directions on command ("put the doll behind the doll house, in front of the doll house, in the doll house," etc.).

2. Naming the major spatial relations in a thematic picture.

3. Development of constructional praxis ("build a set of toy gates, behind them a road, in front of the gates place a toy car," etc.).

4. Development of spatial relations in the child's artistic activities (drawings, modelling with clay, piling up building blocks).

5. Training the child's memory for spatial relations. Analysis of pictures from memory, with emphasis on the spatial interrelationships between objects. Giving a verbal description from memory of the position of objects in space (e.g., that the doll is behind the doll house, or that the tree is in front of the house). Practice at tracing-out trials of constructional praxis ("look and try to remember, and then construct the same figure; look and try to remember, then put the figures in the same order").

Exercises for the development of tactile sensations.

1. Training the child's ability to determine the texture of objects. Recognizing texture by touch upon preliminary demonstration (using small scraps of material of the same shape and same size or building blocks of the same size but different texture).

2. Determining the texture and shape of actual objects without any preliminary demonstration (magic bag technique, using a small glass bottle, wooden spool, and small metallic ball).

3. Differentiating between different geometric bodies by means of touch:

(a) bodies of the same shape, but different thickness (plane and solid);
(b) bodies of the same shape and thickness, but different size (large and small);
(c) bodies of the same size and thickness, but different shape (triangle, square, oval, circle, trapezoid).

This ability is developed in stages:

STAGE I. Recognizing solid figures by touch following a preliminary process of visual familiarization with each figure;

STAGE II. Recognizing solid figures with the same texture without any preliminary demonstration;

STAGE III. Recognizing plane figures with the same texture following a process of visual familiarization with each figure;

STAGE IV. Recognizing plane figures by means of touch without any preliminary demonstration;

STAGE V. Recognizing figures of the same shape but with different texture by means of touch following a preliminary examination of the figures;

STAGE VI. Recognizing the shape and texture of an object by touch without first looking at it (for example, glass bottle, wooden sphere, metallic square);

STAGE VII. Distinguishing objects of the same shape and texture on the basis of their size by means of touch (for example, given wooden sticks of different sizes – with size difference on the order of 2-3 cm – the child may be asked to point to the largest stick, smallest stick, finally any small stick whatsoever, i.e., regardless of its relative size).

Development of temporal imagination.

1. Determining the sequence of periods of the year, and specifying each season of the year in terms of its distinctive features using picture cards and verbal descriptions.

2. Determining the sequence of periods of the day, broken down into routine events.

3. Elaborating the concepts of "older" and "younger."

To help the child gain the ability to make generalizations, exercises are conducted to develop generalizations by the method of elimination (odd fourth game):

STAGE I. Before the child are placed four objects, all but one of which are related to each other by means of definite properties (for example,

apple, pear, plum, toy pyramid), and the child is asked to discard the odd object.

STAGE II. Eliminating odd objects from a picture (for example, a girl is asked to do her homework; on the table are placed all the writing materials she will need along with one or two extra not called for in the assignments).

To develop an understanding of cause-and-effect relations, a guessing game is employed. For example, the child is asked what swims and what sinks. Before the child is placed a basin with water and the most heterogeneous collection of objects made of metal, celluloid, and wood. In the course of the game, skills of independent observation and definite concepts about objects are formed, and cause-and-effect relations discovered.

Many years of observations have shown us that these methods of remediation can help in significantly improving underdeveloped functions and in preparing the child for assimilating the curriculum of a general educational school.

Program of Remedial Activities in Kindergarten Through Third Grade of Special Schools for Cerebral Palsied Children

From the earliest years of operation of schools for children suffering from cerebral palsy, it became clear that students with this disability encounter severe problems in their attempt to assimilate instructional material. Further, it was noted that these problems differ qualitatively from the problems the normal child faces. In elementary school, practical teaching experience has demonstrated that afflicted children have difficulty in acquiring reading and writing skills and the ability to recount stories or create stories on their own from picture cards. Their oral speech consists of short sentences that are not always grammatically well-formed.

In high school, subjects such as geometry, drafting, and map reading in history and geography classes also create major problems for the cerebral palsied student, particularly because of disturbances in spatial imagination. In order to understand why these problems occur, we undertook a special study, the results of which may be found in the preceding chapter.

Interesting data were also obtained regarding the actual quantity and nature of speech disorders. Thus, our studies demonstrated that 170 of the 240 subjects in our group exhibited various speech defects, with 128 of the children suffering from dysgraphia and dyslexia. In addition, these speech defects were found usually in combination with each other; for example, dysarthria was found together with residual manifestations of alalia, and also in many children suffering from dysgraphia and dyslexia. A total of 236 distinct speech defects were found in the 170 children. Similarly, in 70 of the children disturbances in reading and writing skills were associated with im-

pairments in the visual perception of shape and spatial imagination, and in 58 children, with a low level of phonemic analysis and discrimination.

In the first form of dysgraphia, children in the younger age group would forget how to draw separate letters and parts of letters, and also were unable to correctly combine elements to form a single letter. Sometimes we find that too many elements of one kind or another have been drawn; in other cases, a required element or an entire letter is missing, or the element or letter replaced by others based on an attribute of graphical analogy. Many of the subjects produced mirror images of entire letters or parts of letters. Children in the middle and older age groups made a considerable number of these types of characteristic errors in their writing exercises. From an analysis of these errors, we were able to identify several subgroups in this form of dysgraphia: (1) replacement of isolated letters and elements of letters by others according to the principle of graphical analogy; (2) omission of individual letters and elements; (3) interchanging individual letters and parts that generate these letters; and (4) drawing of mirror images of isolated letters and elements of letters. In addition, in cerebral palsied children these errors are persistent and extremely common.

Note that these subgroups are provisional and depend upon which particular symptom is dominant. Studies showed that writing defects which fall in the first two subgroups are found mainly in conjunction with a low level of visual perception of shape; reading and writing defects typical of the third and fourth subgroups are attributable to underdevelopment in spatial imagination.

Pupils in elementary school exhibiting this form of dysgraphia omitted letters as they were reading the primer and textbook *The Reader* [*Rodnaya Rech'*], forgot how to read particular letters, and also replaced certain letters by others based on analogies in graphical form (for example, confusing the letter pairs "c" and "e").

Children in our group from the middle and older age groups did not display elements of dyslexia when reading out loud. It was apparent, however, that when a pupil was reading to himself, he was often unable to understand the meaning of this or that word he had just read, as he would seem to suddenly forget the meaning of some letter.

In 58 of the students, reading and writing defects were observed that could be attributed to underdevelopment in phonemic analysis and discrimination and to defects in pronunciation. In this form of dysgraphia, we typically observe errors associated with disturbances in auditory discrimination and underdevelopment in phonemic analysis, one result of which was a misapprehension of the structure of the sentence, word, or syllable. The following types of errors are found most often in the writings of children with this form of dyslexia: (1) interchanging phonemes that are similar in sound, for example, "s" and "sh"; (2) omission of letters in a word; (3) interchanging

letters and syllables; and (4) forgetting to complete the inflectional endings of words.

When reading out loud, such children usually display incorrect stress in their pronunciation of words and disturbances in intonation. Writing is closely associated with oral speech and, consequently, disturbances in oral speech (for example, dyslalia, dysarthria, general impairment in vocal development attributable to amblyacousia or residual effects of alalia) are manifested generally in writing, thus resulting in dysgraphia.

From a comparative study of reading and writing skills in cerebral palsied children in the younger and older age groups, it became clear that these disturbances are found in children from different age groups. Thus these disorders will not disappear unless the afflicted children are given special guided lessons.

Our data also show that defects in stereognosis, the visual perception of shape, spatial imagination, and elements of dysgraphia are found both in the younger and older age groups (at rates of 76% and 42%, respectively). Significantly, these disturbances do not vary qualitatively with either age or training, but only quantitatively; for example, the number of errors may lessen, though the type of error remains the same. So persistent is the disturbance in reading and writing as to present a problem later on when the person is deciding on an occupation.

Special studies were conducted for the purpose of determining the outlook for compensation of these disturbances and to help in deciding on methods of remediation. In the decade from 1962 to 1972, groups of children were formed, consisting of 104 children 7-9 years of age attending the first grade at Leningrad Regional Boarding School No. 9. A number of different forms of impairment in cognitive activity (astereognosis, defects in the visual perception of shape and color, underdeveloped spatial and temporal imagination, different speech disorders) were found in the children. Special corrective lessons were conducted with the children for eight-month periods. These remedial efforts produced a number of interesting results. Disturbances in the visual perception of shape could be eliminated in 93% of the children; spatial disturbances in 71%. Reading and writing defects caused by disturbances in these forms of cognitive activity could be overcome by corrective remediation of the visual perception of shape in 88% of the children, and of spatial imagination in 70%. Dysgraphia and dyslexia associated with underdevelopment in phonemic analysis and discrimination could be compensated in 75% of the specially instructed children.

The remedial program was designed to meet certain principles, for example:

(1) maintain the successive step-by-step development of processes of cognitive activity actually observed in ontogenesis;

(2) reliance on the integrated functioning of the analysor systems; thus

in training the child's phonemic discrimination, our aim was to rely not only on the auditory analysors, but also on the speech-impellent, kinaesthetic, and visual analysors;

(3) use of intact or already restored functions in lesson activities;

(4) verbal analysis of objects, events, and actions.

Experience gained in the remedial program conducted with cerebral palsied children at Special Boarding School No. 9 has shown the importance of allocating time in the teaching process for a preparatory year. In addition, class periods should be set aside throughout the instructional time in elementary school for the purpose of remediation of impairments in cognitive activity and speech through the use of specially designed techniques. Studies carried out at the boarding school from 1970 to 1975 showed that corrective activities in a number of areas (spatial and temporal imagination, vocabulary) should be continued in secondary school. At this time, the remedial lessons should be designed to fit directly in the curriculum.

A program for elementary school pupils was designed to compensate the different types of impairments we have discussed. The program was tested at Boarding School No. 9 from the 1967 through 1976 school years. From experience gained in lessons conducted in this program, it became clear that the various impairments can be compensated either partially or completely. Students with cerebral palsy could thus be given the opportunity to assimilate the curriculum of a general education school.

The remedial program we employed was designed for the first four years of elementary school (a "preparatory" or kindergarten year and first, second, and third grades). The lessons in the program should be conducted during remedial periods allocated in the lesson plan. During the remedial lessons, the teacher should concentrate on helping those students in whom disturbances in cognitive activity and speech have been observed, rather than directing his efforts at the entire class. The remedial program consists of several parts:

(1) development of the visual perception of shape and color;

(2) remediation of impairments in spatial imagination;

(3) compensation of impairments in temporal imagination;

(4) cultivation of phonemic discrimination and analysis;

(5) improving the child's ability to make generalizations and distinctions through the development of oral speech.

In each part of the program we indicate the title of the topic, content of the activity, types of remediation, and knowledge, habits, and skills the students should assimilate in the course of studying the particular topic.

In the preparatory year, the student is taught to identify the basic colors of the spectrum and their tones, and shown how to select similar geometric figures (circle, oval, square, triangle, rectangle) based on the attributes of shape, color, and size. In the first grade, the children are taught to differenti-

ate between these figures and the various types of polygons, and also to identify solid shapes based on their volume. In the second grade, the students are presented with analyses of the distinctions found when making comparisons based on the attributes of size and volume. Lessons to teach students how to construct different geometric figures are also conducted. Finally, in the third grade the student is shown how to construct quadrangles and angles of different sizes using ruler and compass. The student is also shown how to create models of a square, rectangle, cube, and parallelepiped from paper and plasticene, and to carry out analyses based on similarities and differences between these figures.

In developing spatial imaginatation in the preparatory grade, emphasis is placed on the student's skill at orienting himself to his body schema and opposite someone in a seated position, and his ability to correctly relate the position of objects in space, using such concepts as "to the right"–"to the left," "forward"–"backward," "up"–"down," "near"–"far," and "low"–"high."

Considerable attention is devoted to the development of constructional praxis and to efforts at improving the child's memory of spatial relationships. In the first grade, steps designed to develop constructional praxis and to train the child's memory of spatial imagery continue. In addition, emphasis is placed on the synthesis of a whole from a collection of parts and on the verbal description of different travel paths and programs. In the second grade, exercises designed for the development of constructional praxis and construction activity are conducted. Finally, in the third grade the child is asked to draw different travel paths and programs. Emphasis is also placed on the disposition of coordinates and the proper relationship between several geographic objects given in the instructional material.

In kindergarten, the topic "Temporal Imagination" is meant to encompass the improvement and expansion of the child's imagery of the seasons of the year and times of the day, along with their distinctive features and sequence. The child is taught how to tell time by reading the face of a clock (on the whole hour only).

In the first grade, the child must know how to recognize time by reading the face of a clock (hour, half-hour, quarter-hour) and to correctly relate events to facts in his own biography and in the lives of his parents ("Yurii Gagarin traveled into the space the year I was born"; "The war took place when Mama was little").

In the second grade, the child should know how to tell time within minutes and seconds by reading a clock face, and should know that a century represents 100 years. Students are familiarized with the sequence of historical events in the life of the Soviet Union (Russian Revolution, World War II, the flights of the cosmonauts).

As an integral part of the lessons in this topic in the third grade, the student is taught to determine temporal sequences when reading essays on the

history of Russia and the Soviet Union, and must be able to relate stages in the development of Soviet society with events in his own family and in the life of his friends and relatives.

The program for the section, Development of Phonemic Analysis and Discrimination, in kindergarten is designed to prepare the child for the acquisition of reading and writing skills. Particular attention is paid to the analysis of the sentence, word, and syllable, and the identification of sounds. Corrective work begins with the development of phonemic discrimination; a large number of exercises are conducted for the purpose of teaching the child how to identify and differentiate auditory parallels by ear, for example, vowels and consonants, flat and groove sibilants, voiced and unvoiced consonants, hard and soft consonants, and sonorants ("l" and "r," "m" and "n") and affricates ("ch," "shch," and "ts").

In kindergarten, emphasis is placed on the development of skills of generalization and differentiation, and on the addition to the child's vocabulary of words denoting spatial and temporal representations.

In the first grade, exercises to help the child determine logical relations in passages that have been read through or listened to are given. The meaning of proverbs and sayings is analyzed, and evaluative epithets regarding particular objects and events are selected; creative activities are also conducted. In the first grade, the analysis of sentences, words, and syllables continues, accompanied by an emphasis on the identification of stressed syllables and on the intonational pattern of sentences as a function of the type of sentence. Activities designed for speech development extend throughout all the lessons, though in the remedial lessons emphasis is placed on enlarging the child's receptive and expressive vocabulary, and teaching him how to determine logical relations, understand sentences with figurative meanings, create oral and written compositions, and how to put together a story on his own. In each grade, the content and type of remediation are designed in light of the child's development features and the instructional material.

In the second grade, the child's vocabulary is enriched with words referring to human emotional states and natural phenomena, as well as words that fall under the topic, Means of Transportation and Communication. One new area is in familiarizing the child with the multipe meanings of words as exemplified by synonyms, homonyms, and antonyms, and by teaching him about figurative expressions and metaphors, as well as different styles of writing (prose and poetry, stories and tales).

Lessons in the third grade dealing with the development of vocabulary are constructed to emphasize new terms dealing with historical, geographical, and biological concepts the child has read about in essays on nature study. The student should learn how to properly isolate the parts of a story and be able to ask a question about each part. He should also be able to identify the main theme of a story. A great deal of creative activities are con-

ducted with the child in the third grade, for example, describing things the child has seen or heard, and teaching him how to invent stories and tales on a given subject on his own.

In this program, remedial work helps to compensate for impaired processes of cognitive activity in cerebral palsied children and helps them successfully assimilate the instructional material. From an analysis of the difficulties encountered by students in their studies in secondary school, we were able to decide on directions for corrective activities in this period. The following goals were selected in constructing the set of compensatory lessons:

1. Formation of spatial imagination using instructional material in geometry, geography, and drafting.
2. Development of temporal imagination using material from literature and history lessons.
3. Vocabulary work, in particular: (a) practice in special terminology for the study of different objects; (b) words denoting spatial and temporal imagery in the instructional material; (c) terms denoting abstract categories.
4. Development of oral speech, in particular: (a) grammatically correct sentence construction; (b) use of numerals and pronouns of all categories, auxiliary words, and prepositions in speech.
5. Development of manual dexterity in guided shop lessons and the introduction of specialized tools to help the student perform laboratory activities in polytechnical training lessons.

Below we present our program of remedial activities for elementary school students suffering from cerebral palsy.

Kindergarten Program

Topic: Visual Perception of Color.
Content, Forms, and Goals of Remedial Activities

I. Differentiation of basic colors through the identification of a given color. (1) selection of colored strips by analogy, without naming the colors themselves ("Show me a strip of material of a given color"); (2) activities with color charts; (3) playing games of color lotto; (4) selecting colored pencils and sticks; (5) distributing circles of different colors into small boxes or envelopes of the corresponding color; the child must know how to select colored strips on command and how to differentiate (visually) between the basic colors of the spectrum.

II. Basic colors of the spectrum and their tones. (1) lessons with color charts; (2) playing games of color lotto; (3) coloring patterns and stencils from a model using pencils and paint and again without any model; (4) creating color tones on a palette (dark red, dark blue, pale blue, etc.); the child should (a) know the names of the basic colors of the spectrum; (b) be able to recognize and name colors and paints in nature; (c) know how to create tones of the basic colors of the spectrum by pressing down upon his pencil lightly or heavily, by diluting paints, or by repeated application of paint.

III. Derivative colors and their tones. Creating derivative colors and their tones on a palette, for example, orange and light and dark orange; violet and light and dark violet; green and light and dark green. The child should know how to create orange, green, and violet on a palette through the superposition of one color on top of another.

Topic. Visual Perception of Shape.
Content, Forms and Goals of Remedial Activities

I. Selection of similar geometric figures (square, circle, rectangle, triangle, oval, polygon). (1) outlining geometric figures using stencils; (2) exercises using geometric inserts (plane and solid), e.g., (a) Seger board, (b) barrel with set of solid geometric shapes; (3) playing games of geometric lotto; (4) activities using geometric mosaics. The child should know how to select geometric figures, for example, how to find by means of analogy, a figure of the same color and shape, or how to find, by means of incomplete analogy, a figure of the same shape, but different color, or a figure of the same shape, but different size. Simple comparisons are made between geometric figures on the basis of an integrated visual perception without any identification of basic attributes.

II. Differentiation of geometric figures in terms of shape, size, and color. (1) exercises with the magic bag; (2) exercises using cut-outs consisting of geometric figures, with the child pasting into a mold figures of the proper size and shape. The child should (a) know the names of geometric figures and their principal attributes; (b) know how to find a geometric figure by name, i.e., be able to point out a circle, oval, square, etc.; (c) be able to call out the name of a geometric figure at the teacher's command, i.e., respond to such questions as, "What is this figure?"; (d) be able to identify geometric figures in terms of shape, size, and color (Figure 11).

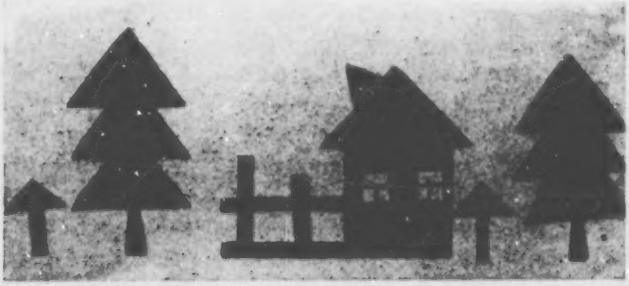

Figure 11. Cut-outs consisting of geometric figures.

III. Relationship between a geometric figure and the shape of real objects and pictures of real objects: (1) playing games of geometric lotto; (2) playing such games as "object and picture"; (3) creating pictures of objects from two-dimensional geometric figures; (4) creating cut-outs of objects consisting of the same or different geometric figures. The child should be able to relate (a) a real object and a given geometric figure (book and rectangle, table-top and rectangle, flag and triangle, egg and oval, etc.); (b) a geometric figure and a picture of a real object (circle and watermelon, oval and melon, triangle and road sign, etc.).

IV. Comparision and transformation of geometric figures. Exercises using a collection of constituent parts of geometric figures. The child should know how to (a) create a complete geometric figure from its parts; (b) transform one geometric figure into another.

Topic: Development of Spatial Imagination and Orientation
Content, Forms, and Goals of Remedial Activities

I. Orientation with respect to the body schema and opposite someone in a seated position: (1) exercises designed to teach the child how to determine his own right- and left-hand sides relative to someone sitting down; (2) exercises for determining the right- and left-hand sides of people depicted on picture cards and in sketches; (3) playing games such as "mirror," "monkey see, monkey do," "Simon Says." The child should be able to (a) display the proper skills of orientation; (b) be able to point to his left ear, eye, etc. with his right hand, etc., and conversely, point to his right foot, eye, etc. with his left hand (cross orientation).

II. Relative position of objects in space, based on such concepts as: on the right – on the left, forward – backward, up – down, near – far, low – high: (1) playing such games as "What has changed?" (recalling the relative position of three or four objects); (2) finding an object in a chart from a verbal description of its position relative to other objects; (3) finding an object in the classroom from a description of its position relative to other objects; (4) finding an object from a verbal description of its position relative to the student himself and the position of some other student (i.e., in response to such commands as "Name the objects to your right, to the left of Kolya," etc.); (5) placing an object in accordance with a verbal command ("Place the notebook at the upper left corner of your desk and the pencil at the upper right corner of your desk with its sharpened point to the left," etc.). The child should (a) be able to correctly indicate the position of objects relative to each other, relative to the student himself, and relative to someone else; (b) understand the meaning of words that express spatial relationships, i.e., the student should be able to employ precise verbal statements for all sections of the curriculum.

III. Development of the child's understanding and use of words that express the relative spatial positions of objects ("at," "on," "under," "behind,"

"in," "around," "between," "in front of," "over"): (1) defining the relative position of an object in the classroom, in a chart, and in a picture by means of a precise verbal statement (e.g., "The spoon is in the glass," "The glass is on the table," "The table is near the window," etc.); (2) placing an object somewhere on command ("Put the pencil on the book, under the book, in the book, etc."). During this period of time, the student should know how to use precise verbal statements that express the relative spatial positions of objects (Tol's desk is in front of Serezh' desk or between Serezh' and Sasha's desks," etc.).

IV. Development of the child's understanding and use of words that express extent (to the right–on the left, to the left–on the right, from above–downward, from below–upward, from the upper left corner to the lower right corner, from the lower left corner to the upper right corner, from the upper right corner to the lower left corner, from the lower left corner to the upper right corner). The student is asked to (1) draw lines on his own blackboard, in his sketchbook, or in his notebook in accordance with the teacher's command (to the right–on the left, etc.); (2) the student is asked to perform actions on command (how to go from the left rear corner of the classroom to the right front corner, indicating direction by means of hand signals, etc.). The child should be able to perform actions on command.

V. Development of the child's memory of the relative spatial positions of objects: (1) playing games such as "What has changed?"; (2) mosaics; (3) pictures, drawings, charts (with different versions in which the same objects are arranged in different ways); (4) playing such games as "look and remember" (with the student's own cards and charts being used for activities in which the whole class participates). Objects or geometric figures colored in different ways are depicted on cards. The student is asked to recall (a) the position of the objects on the card (in the center, at the top, in the upper right corner, etc.); (b) the relative position of the objects or figures. Three to five objects are used; the time allotted for recall is limited (1 minute). The student then responds to the teacher's questions from memory. He learns how to (a) compare the initial relative position of some object to its altered position; (b) reproduce from memory the relative position of two to four objects.

VI. Development of constructional praxis: (1) direct copying of parts; (a) successive copying of a graphical diagram part by part (drawing a line in the same way as the teacher); (b) copying an entire model (the diagrams may all be the same, but now the child is asked to copy a finished model); (c) drawing the mirror images of parts consisting of two or three sections; (3) construction (a) from paper (small boat, glass, purse, cap, shirt); (b) creating an image of an object from elements (jigsaw picture cards and collapsible blocks); (c) using different types of children's erector sets [*konstruktor*]. The activities may involve graphical diagrams or cut-outs and the material may be put together by means of sticks, matches, strips of material, etc. Tasks may be made more complicated through a gradual increase in the number of

elements in the diagram or by specifying more complicated relative positions. The child should know how to copy a model part by part and as a whole; (4) construction of letters from elementary elements preceded by an analysis of the letters: (a) printed letters and elements of printed letters; (b) handwritten letters; (c) recognizing a letter by means of elements, whether upside-down or crossed-out. From these elements, it is possible to create any printed letter of the alphabet, though there must be a sufficient number of each element provided.

VII. Development of motor praxis: (1) successive simulation of movements element by element: (a) in games; (b) orienting exercises; (c) exercises using diagrams that depict different human motions; (2) integral copying of a motor complex in which a group of movements suggested by the teacher is undertaken by the student as a whole, rather than element by element; (a) playing games such as Simon Says, Signalman, Monkey See- Monkey Do; (b) imitative motions ("How does a bird fly, a train travel, or a fox steal; how may soup be salted, how does one thread a needle?" etc.).

Figure 12. Recognizing letters and elements of letters: (a) recognizing a letter from its elements; (b) calling out the names of crossed-out letters; (c) recognizing a letter written upside-down; (d) identifying a letter from its mirror image.

These activities are designed to help the child undertake arbitrary movements on command and in imitation of a grown-up.

Topic: Development of Temporal Imagination.
Content, Forms, and Goals of Remedial Activities

I. Improved understanding and expansion of the child's range of imagery dealing with the seasons of the year. A. Understanding sequences in

the succession of the seasons of the year. B. Attributes of the seasons of the year, together with an explanation of the cause-and-effect relationships between events in nature ("Why does it snow?" "Why is there frost?" "Why isn't the sun very warm in winter?" "Why do birds fly?" etc.). (1) making observations on seasonal changes in nature in the course of excursions; (2) the course of time (succession of the seasons of the year); (3) exercises with the class calendar (natural events and people's jobs in different seasons); (4) observations on changes in nature: (a) comparison and correlation between trees and bushes, mantle of the earth, air temperature, position of the sun above the horizon and length of daylight, etc.; (b) comparison and correlation of a picture from the life of animals and people's jobs in connection with changes in nature; (5) tales, poetry, riddles, songs, and proverbs about the seasons of the year; (6) seasons of the year in literary works; (7) seasons of the year in music (Tchaikovsky). These activities help the child acquire the ability to (a) create his own weather calendar (under the teacher's guidance); (b) create a classroom picture calendar of nature.

II. Improve and enlarge the child's imagery dealing with the times of the day (morning, daytime, evening, night; their attributes and sequence). (1) course of time with respect to school routine; (2) riddles about different times of the day, proverbs, sayings; (3) explanations of the concepts of "today," "tomorrow," "yesterday," "early," and "late" on the basis of the child's life experience, making use of the characteristic attributes of the different times of the day; (4) explanation of the concepts of "breakfast – to eat breakfast," "dinner – to eat dinner," and "supper – to have supper" in relation to the different times of the day. The child should (a) be able to give the designations for the different times of the day in sequence; (b) know the basic attributes of the different times of the day in relation to the school day and people's occupational activity; (c) be able to make conscious use of the concepts of "today," "tomorrow," "yesterday," "early," and "late" in his speech.

III. Notions such as the "hour" and "half-hour." Course of time in light of the routine of life in the school and in people's occupational activity.

IV. Notions about the days of the week. Exercises using the weather calendar for each day of the week. A major expansion of the child's vocabulary results; the child can now name the days of the week in order.

V. Concepts of time derived from the child's life experience (hour, day, one year ago, two years ago, in a year, in two years). (1) telling time by means of clocks; (2) conversations designed to exhibit and improve the child's understanding of different periods of time. The child should know how to (a) tell time on the whole hour by reading the face of a clock (so as to decide on the time for routine events); (b) relate events and facts from his own current experiences to his past and future (over a one- or two-year period).

Topic: Development of Skills of Generalization, Differentiation, and Comparision

Content, Forms, and Goals of Remedial Exercises

Classification (in terms of generic and visible attributes) within such topics as "school things," "games" (sports, such as football, basketball, hockey, tennis, volleyball, and Russian version of skittles, and seasonal games, such as winter sports, summer games), "vegetables" and "fruit." Different kinds of group and individual activities using picture cards and charts depicting material dealing with these topics. Educational games, toys, and objects placed near the children are extensively utilized.

I. Identifying an object from among a group of similar objects: (1) exercises using charts and educational material; (2) educational games such as "What don't we need?" "The odd third," "The child has lost his way," etc.; (3) exercises using word cards (such as cards for vegetables, e.g., carrots, beets, and onions; cards for tools, e.g., hammer, axe, and saw).

II. Identification and classification of objects that have been taken from a group of similar objects in terms of generic and visible attributes: (1) "clear up the confusion" game; (2) working with a "patchwork quilt" [*nabornoe polotno*] for exercises in classification, for example, using a set of thematic picture cards or set of word cards once reading skills have been mastered.

III. Direct generalization: "A wasp. Now what is that? An apple, a pear--what are these?" "A hammer, axes, saw--give me (generalize in) one word that describes all these objects." "Give me the names of different vegetables, furniture," etc. (1) exercises using a patchwork quilt for classification; (2) competitive games, e.g., (a) "which group is larger?" (students in one row call out the names of clothing, and those in another row the names of fruit, etc. and the row whose list of objects is larger wins); (b) "Who is faster?" (in this game, one row of students is asked to gather "dishes," another row "furniture," and so on; on command the students place cards with pictures or words from some generic group from the patchwork quilt on a board one after the other; the row of students that completes the assignment quickest wins).

IV. Generalization through contradiction ("scarf--clothing, overshoes --_____?").

V. Comparison and matching of objects in terms of similarity and differences (drills involving the concepts of "same--different," "similarity--difference," "compare," "match up," "draw a conclusion"): (1) exercises using a set of two or three picture cards on the same topic that differ in terms of minor details (the child might be asked, "Compare these picture cards. How are they similar, and how are they different?"); (2) comparison of geometric figures in terms of such attributes as shape, size, and color; (3) comparison of attributes of the different periods of the year (nature).

Topic: Development of Oral Speech
Content, Forms, and Goals of Remedial Exercises

I. Improvement and expansion of the student's vocabulary in areas covered by topics in the corrective program. The types of activities are indicated in the preceding topics of the program. The student should be able to create a sentence from disconnected words.

II. Development of the ability to determine the logical sequence of events and logical connections from picture cards and written text, given some motivating principle (e.g., "Why are the picture cards arranged in this way?"). Text exercises continue in the second half of the year. From these exercises, the students should gain the ability to (a) arrange three or four thematic cards in a logical sequence; (b) determine logical relations in a text consisting of three or four sentences; (c) work with disconnected strings of words.

III. Creating stories from pictures arranged in a logical sequence. Creating stories from a series of thematic picture cards.

IV. Expressing thoughts by means of grammatically well-formed sentences.

A. Understanding the logical relation between words in a sentence: (1) exercises using contextual picture cards; (2) creating a story from three or four grammatically well-formed sentences based on the results of observations on excursions, walks, and games. The student should be able to respond (in grammatically well-formed sentences) to such questions as "What?" "Who is this?" "What should we do?" "What happened?" "What is that?" "Where?" "Where are you going?" "To whom?" etc.

B. Understanding and practical mastery of inflectional relations* in the use of prepositions (onto, under, by, behind, from, towards, with, etc.). (1) direct execution of actions specified by means of commands that use prepositions ("Put it on...," "Walk towards...," "Go away from...," "Go from behind...," "Drop down from...," etc.); (2) verbal description of completed actions; (3) exercises using contextual picture cards. The student should learn how to (a) create a simple sentence from a picture card; (b) set forth his thoughts in a logically correct and properly ordered manner; (c) use case endings correctly.*

C. Understanding and practical mastery of verbal aspects,* inanimate and animate categories, singular and plural forms: (1) carrying out actions, followed by verbal expressions using perfective and imperfective verbs.* Example: "Kolya, draw a doll house on the blackboard."

-What is Kolya doing?
-Kolya is drawing.
-What did Kolya do?
-Kolya drew a doll house and then sat down at his seat.

*Here and below, grammatical caterogies peculiar to the Russian language (Trans.).

(2) contextual picture cards. Example: "The little boy goes to the door. He opened the door." (3) asking questions ("Who is this?" "What is this?") of the child regarding animate and inanimate objects and thematic picture cards depicting them; (4) execution of concrete actions related to the use of the singular and plural categories, and verbal expression of these actions. Example: "[name], take the building block" – "Children, take the building blocks," "[name], take the red pencil" – "Children, take the red pencils." (5) use of singular and plural categories in speech in exercises involving thematic and contextual picture cards. The student should be able to correctly use the names of objects, their attributes, and the various actions possible with them in the singular and plural.

V. Understanding the meaning of the simplest syllogisms; working with such syllogisms as "All elephants have a trunk. Tommy is an elephant. Consequently..." As a result, the student gains an understanding of syllogisms.

VI. Understanding sentences with figurative meanings. Analysis of phrases such as "golden hands," "iron hands."

VII. Understanding of proverbs. Analysis of such proverbs as "Don't count your chickens before they're hatched" [lit.: "Count your chickens in the Fall." – Trans.]. The student should be able to apply the meaning of well-known Russian proverbs to events in his daily life and ordinary experiences.

VIII. Selecting the proper epithets for particular objects and events, for example, "tree," "sun," "night," "winter," "fall." Ultimately, the student should be able to select epithets for words drawn from the curriculum.

IX. Creative activities: (1) creating short oral presentations focused on particular key words, for example, "frost, eggs, hunter, shot, rescuing, ran away"; (2) creating an oral presentation on assigned topics, such as "winter," "summer," "spring," "fall," "school," "animals." These activities should lead to the formation of expressive and receptive vocabulary; the students should be able to create presentations focused on key words or assigned topics; (3) recognizing a familiar text from some part of it. The text should be 5-8 lines long and be taken from the middle of a well-known literary work so that the child will be able to determine the nature of the work (i.e., whether a story or tale), and then continue it. After reading the section, the child should be able to give the name of the story or well-known work.

Topic: Development of Phonemic Discrimination and Analysis.
Content, Forms, and Goals of Remedial Activities

I. Development of phonemic discrimination: Identification and differentiation of auditory parallels by ear, e.g., vowels and consonants, groove and flat sibilants, voiced and unvoiced consonants, hard and soft consonants, sonorants ("l" – "r," "m" – "n") and affricates ("ch" – "ts" – "sh"). Games involving exercises in onomatopoeia, e.g., *puzyr'* [bubble] (z – z), *gusi* [geese] (s – s),

zhuk [beetle] (zh – zh), etc. The student should be taught how to mimic the corresponding sounds. Emphasis is placed on teaching the student how to produce sounds through the use of games, such as (1) games designed to develop phonemic discrimination:

(a) "What hisses and what whistles?" (using material from the thematic picture cards);

(b) "The sounds have been lost" (lines of poetry taken from *Grammatical Divertisements* [*Zanimatel'noi grammatiki*];

(c) Oral "relay race" (the aim being to complete some word).

The students gain the ability to (a) distinguish, by ear, contrasting phonemes (grocve and flat sibilants, voiced and unvoiced consonants, hard and soft consonants, sonorants), and can discriminate and identify a designated sound in a word; (b) distinguish between consonantal and vowel sounds in a word by means of the method of sound formation and pronunciation. Thus, the main distinguishing feature for differentiating between vowels and consonants is in pronunciation; that is, in pronouncing a vowel sound, air is allowed to freely pass through the oral cavity, whereas in pronouncing consonantal sounds the air encounters an obstruction in the oral cavity, either the tongue, lips, or teeth; (2) exercises using the book, *Alphabet in Pictures* [*Azbuka v kartinkakh*] (a picture is selected for a designated sound, for example, "s" – "*sumka*" [bag], "k" – "*kniga*" [book], etc.); (3) creating words containing a designated sound using letters from a set of alphabet blocks.

II. Development of phonemic analysis: A. Division of a sentence into words. B. Syllabic and acoustic analysis of a word, in which the first stage comprises a division of the word into syllables, and the second stage an acoustic analysis of the word. The concept of a syllable is developed in the course of dividing words into syllables. (1) creating a sentence from key words and from picture cards; (2) determining the number of words in a sentence by ear; (3) determining the number of syllables in two- and three-syllable words; (4) determining the number of sounds in a syllable. Acoustic and literal analysis is conducted using words with the same number of letters and sounds.

The student should be taught how to (a) write a sentence diagrammatically, by means of which the number of words is determined; (b) write out a word in a diagram that shows the number of syllables; (c) write out a word in a diagram in which the division of the word into syllables proceeds in terms of the number of vowels in the word; here, the syllable is perceived as a combination of a single vowel and one or more consonants.

III. Teaching the proper articulation of designated sounds: (1) demonstration accompanied by explanation of the proper articulation of a designated sound. Exercises involving diagrams, full-scale models, and mirrors; (2) drills and mechanical training in pronunciation of words, syllables, sentences, connected text (texts for the exercises may be taken from speech

therapy manuals). The students should be able to locate a given vowel in a word.

IV. Determining the number of words in a sentence, number of syllables in a word, and the number of letters and sounds in a word and in a syllable. Writing out sentences, words, and syllables (material is given visually and orally). The student should be able to write out a sentence diagrammatically, with the number of dashes corresponding to the number of words. Children who did not have preparatory training should be given kindergarten-level instructional material on this topic.

V. Identification and differentiation of acoustic parallels (groove and flat sibilants, voiced and unvoiced consonants, hard and soft consonants, sonorants, affricates): (1) identifying contrasting phonemes by ear; (2) inventing words containing designated phonemes; (3) picking out words containing designated phonemes from text. As a result of these exercises, the child should be able to (a) clearly distinguish by ear between words containing contrasting sounds; (b) correctly write out words in a letter. Teaching should begin with a repetition of material from kindergarten.

VI. Identification of the accented syllables in two-, three-, and four-syllable words: Training exercises designed to teach the child how to identify the accented syllables by ear or visually (words for the exercises should be taken from texts on familiar subjects or texts for which the teacher provides a preliminary explanation). The student should be able to identify the accented syllable in two-, three-, and four-syllable words.

VII. Improving the intonation of a sentence. Reading special texts out loud with correct intonation. During this time, the child develops the ability to demonstrate the difference between narrative, interrogative, and exclamatory sentences in writing and speech.

Program for First Grade

Topic: Visual Perception of Shape

Content, Forms, and Goals of Remedial Activities:

I. Selecting similar figures in terms of the attributes of size, shape, and thickness. An appropriate set of geometric figures could include angular figures such as triangles, different types of quadrangles, pentagons, and hexagons, and round figures such as ovals and circles. Figures that are similar in shape may be different in size; in addition, with each plane figure we may associate some solid figure. From this set, the student should be able to select a geometric figure that is similar to a given figure in terms of thickness, size and shape. He should also be taught to distinguish in terms of shape figures that differ in terms of one or two other attributes (color or size).

II. Extracting by sight different triangles from an irregular polygon. (1) comparing quadrangles and rectangles, a rectangle being understood as a special type of quadrangle; (2) comparing rectangles and squares, a square

being understood as a special type of rectangle; (3) comparing triangles and quadrangles (rectangles). A first grader should be able to select a figure corresponding to a given figure in terms of two attributes (shape and size or thickness and shape).

III. Constructing round and angular figures. (1) constructing different types of quadrangles, pentagons, and hexagons from colored strips and matches; (2) creating different ovals, circles, quadrangles, pentagons, and hexagons in the form of cut-outs. The student must be given a clear idea of the various features of these geometric figures and be helped to develop the ability to explicitly differentiate between them.

Topic: Development of Spatial Imagination and Orientation
Content, Forms, and Goals of Remedial Activities:

I. Determining the relative position of elements of objects and parts of animal bodies, for example, the wheels of an automobile, the legs of cats, etc: depicting objects and animals on a magnetized board using various elements (man, house, ship, duck).

II. Synthesizing a whole from four to six parts: (1) creating cut-outs of objects and animals using different elements; (2) creating a whole from jigsaw picture cards or building blocks.

III. Verbal descriptions of different directions of travel (straight ahead, to the left, to the right, upward, downward): (1) developing imagery about paths between different areas in the school (path from the classroom to the therapy offices and so on), and producing verbal descriptions of the path; (2) developing imagery about paths taken on special strolls and excursions and producing verbal description of the paths. As a result of these activities, the student forms the ability to synthesize a whole from four to six parts and develops the ability to create the simplest schematic drawings and produce verbal descriptions of the layout of the school buildings and different paths.

IV. Development of constructional praxis. (1) direct copying of a complete model consisting of six to eight elements; (2) creating a mirror image of a model consisting of four to six elements; (3) reproducing from memory a given figure consisting of four or five elements. The child gains the ability to make direct copies and mirror images of abstract figures element by element.

V. Development of memory of spatial relations: playing such games as "What has changed?" (involving four to six objects). From these exercises, the student develops the ability to remember the relative position of objects in space.

Topic: Development of Temporal Imagination
Content, Forms, and Goals of Remedial Activities

I. Telling time by reading the face of a clock (hour, half-hour, quarter-

hour). Playing such games as "Twelve Months." The student should be able to correctly determine the hour, half-hour, and quarter-hour by reading the face of a clock.

II. Improving the student's imagery about the succession and attributes of the months, and grouping months into seasons. Exercises using the "time tape." The first grader should be taught how to correctly relate a series of events in society at large to occurrences in his own life and the lives of his parents.

III. Determining the sequence of events on the basis of the student's personal experiences (three to four years ago, five years ago, in three to four years, in five years, in ten years): (1) playing such games as "Twelve Months"; (2) exercises using illustrations. The names of the months of the year now occur in the student's vocabulary, and the student gains the ability to successively enumerate the months and to group them into the seasons of the year.

Topic: Development of Oral Speech
Content, Forms, and Goals of Remedial Activities

I. Exercises designed to develop the child's receptive and expressive vocabulary, concentrating on words denoting spatial and temporal imagery: (1) words that define spatial imagery, such as "in," "on," "behind," "under," "by," "around," "between," "higher – lower," "farther – nearer," "wider – narrower," "shorter – longer," "on the right – on the left," "forward – backward"; (2) words denoting temporal imagery, such as "earlier – later," "then," "yesterday – today – tomorrow." (It is recommmended that the student's mastery of receptive and expressive vocabulary be rigorously restricted to the instructional material.) The student should be able to use those terms that define spatial and temporal imagery.

II. Determining a sequence of events by spreading out a series of picture cards, creating stories from the subject matter presented in four to six cards. The student should be taught to properly create stories from series of picture cards.

III. Determining logical relations in a passage. A distorted passage consisting of five or six sentences is presented to the student. The student should be able to create a connected story from a distorted passage consisting of these sentences.

IV. Identifying logical relations in a passage after listening to it being read out loud. The student reads through or recounts a passage consisting of seven or eight sentences, and is then asked to analyze the passage in terms of logical relations and recount it. The student should learn how to recall by ear and analyze a passage consisting of seven or eight sentences.

Topic: Development of Skills of Generalization, Differentiation, and Comparison

Content, Forms, and Goals of Remedial Acitivities

Classifying objects in terms of generic and visible attributes on such topics as "Things," "Plants" (house plants, garden plants, field plants), "Animals" (domestic, wild), "People," "Seasons of the Year," "Family." (1) identifying an object from among a group of similar objects; (2) grouping together the names of different types of objects in terms of generic and visible attributes and selecting generalized words for these groups; (3) direct generalization, e.g., "Winter – now what is that?" "Winter, spring, summer, fall – draw a generalization by referring to all the seasons with a single word"; (4) analysis and synthesis through comparison of two objects or events. The student should be able to (a) find out what is common to two objects or events and in what ways they differ (airplane – bird, whale – submarine, spring – fall); (b) establish, by comparing two objects or events, what they share in common and how they differ from each other.

Program for the Second Grade

Topic: Visual Perception of Shape

Content, Forms, and Goals of Remedial Activities

I. Comparison of geometric figures (a) in terms of the attribute of size; (b) in terms of the attribute of bulk: A collection of figures with different geometric shapes is presented. Figures of the same shape are distinguished in terms of size. Figures of the same shape, but differing in size, are constructed in plane and solid versions. (The geometric figures presented should be taken from the instructional material.) The student should be able to select a figure with a designated shape, but of arbitrary size and volume. He should be able to explain what attributes were used in selecting the figures.

II. Extracting figures with a designated geometric shape (a) from a group of geometric figures; (b) from different geometric figures superimposed one upon the other: (1) the student is given a drawing that depicts various geometric figures; he should be able to pick out a designated geometric figure from the drawing; (2) drawings are presented in which geometric figures are partially superimposed. (The geometric figures given should be taken from the instructional material.) In this period, the second graders all exhibit the ability to determine a designated figure orally or from a given model.

III. Construction of different geometric figures: Exercises using an erector set by means of which different geometric figures are constructed. Creation of cut-outs from geometric figures and extraction of different geometric figures from the resulting cut-outs.

Topic: Development of Spatial Imagination
Content, Forms, and Goals of Remedial Activities

Exercises involving constructional praxis:

I. Mirror-image trials. Creating mirror-images of isolated elements. Together with his teacher, the student creates a figure from construction elements (rods, strips, building blocks, matches), but places each element in its correspondingly mirror position. He creates a mirror image of an entire figure which has been presented to him. (The geometric figures are selected from instructional material on mathematics.) A second grader should be able to create a mirror image of designated designs.

II. Tracing trial. Copying a designated figure consisting of four or five elements from memory. The student should be taught how to copy a plane design of four or five elements from memory.

III. Constructing a figure at the teacher's direction. The teacher indicates the number and orientation of the elements, and the student is then asked to complete the corresponding construction. The student should be able to complete a graphical construction on a verbal command.

IV. Creating constructions from geometric figures using a proposed model. A desired construction is put together in the form of cut-outs starting with different geometric shapes. Analogous activities are conducted with building materials. (The geometric figures and constructions should be selected from instructional material on mathematics.) At this time, the child gains the ability to construct a designated plane construction using geometric figures, for example, a decorative pattern consisting of geometric figures.

Topic: Development of Temporal Imagination
Content, Forms, and Goals of Remedial Activities

I. Work with clocks (learning about the minute and second hands). Practice exercises with clocks to learn how to tell time to within minutes and seconds. The student should be able to tell time by means of a clock to within minutes and seconds.

II. A century represents 100 years. The concept of the number of years in a century and 100-year period is presented.

III. Determining the sequence of historical events in the life of the Soviet Union (Russian Revolution, World War II, flights of the cosmonauts). Exercises involving picture cards and books on historical themes and guided excursions. At this stage the child's knowledge of the sequence of historical events in the life of the Soviet Union is developed.

IV. Determining the sequence of holidays in the calendar (November 7, March 8, New Year's Day, May 1). Creating a time tape based on the holidays in the calendar. All the second graders should know the sequence of holidays from the calendar and be able to correlate any day in the year with its seasons.

Topic: Development of Oral Speech
Content, Forms, and Goals of Remedial Activities

I. Enrichment and development of vocabulary related to human emotional states and natural phenomena (for example, "enjoyment," "sadness," "night is falling," "dawn is breaking," "it is raining," "it is cloudy," etc.): (1) observing the different emotional states of man and natural phenomena; (2) creating a weather calendar; (3) analyzing passages in which words occur that denote human emotional states and natural phenomena. The student should be able to (a) give the correct names of the different emotional states of man; (b) observe natural phenomena and describe the different states related to these phenomena, for example, "frivolously," "gloomy," "foggy," "drizzling."

II. Development of receptive and expressive vocabulary dealing with the topic of "Means of Communication and Transportation:" (1) guided excursions; (2) lessons to teach the student how to analyze into constituent parts the different means of communication and forms of transportation. In these lessons the children gain vocabulary related to these topics.

III. Exercises concentrating on the multiple meanings of words, expressed through synonyms, anonyms and antonyms: (1) practice exercises to teach the student how to select a synonym and antonym to a designated word; (2) build-up of vocabulary. By means of these lessons, the student should gain the ability to select synonyms and antonyms to a designated word and to learn how to use them in oral speech and written composition.

IV. Exercises involving figurative expressions, analogies, and metaphors (simple examples): (1) identifying figurative expressions, analogies, and metaphors when reading different passages; (2) identifying figurative expressions, analogies, and metaphors in passages that the student has heard; (3) preparing oral reports and written compositions consisting of six or seven sentences in which metaphors and analogies are employed. As a result of these activities, the student should be able to identify figurative expressions, analogies, and metaphors in passages he has either read or heard, and be able to explain the attributes according to which he made these identifications. He should also be able to create stories, making proper use of metaphors and analogies. It is recommended that a glossary of words dealing with these topics be created.

V. Exercises designed to teach the child how to distinguish between different styles: (1) creating prose passages and poetry. Here note that in poems the endings of the line must be in harmony in terms of rhythm and rhyme; (2) comparing prose passages and poetry by ear and by sight. The distinctive features of fairy tales are noted, with emphasis placed on elements of fantastical language found there, unlike the case of stories; (3) comparing fables (characters, moral, allegory) and poetry. The student should (a) be able to distinguish prose and poetic genres by ear and by sight; (b) know how to

differentiate poetry and fables, fairy tales and stories in terms of content; (c) know and be able to cite elements that are characteristic of stories, fairy tales, and fables.

Program for the Third Grade

Topic: Visual Perception of Shape
Content, Forms, and Goals of Remedial Activities

I. Constructing different types of angles, quadrangles, pentagons, and hexagons. Constructing different types of quadrangles (square, rectangle, parallelogram) and angles (right, acute, and obtuse) by means of ruler and compass. The student should be able to construct different types of quadrangles and angles by means of ruler and compass.

II. Differentiating between plane and solid figures (square and cube, rectangle, parallelogram, and the corresponding parallelepipeds): (1) exercises involving the comparison of plane and solid figures (performing comparative analysis); (2) creating squares, cubes, rectangles, and parallelepipeds from plasticine and paper. At this stage the child should be able to create models of these geometric figures from plasticine and paper and to conduct analyses of the figures based on analogies and differences between them.

III. Division of a whole into parts: (1) creating models of circles, squares, rectangles, and isosceles triangles from paper, and then dividing the figure obtained into two, four, or eight parts; (2) cutting up a given figure into two or four parts and then, by combining the parts obtained, proving that they are equal. The student should be able to divide a circle, square, or rectangle into two or four equal parts.

IV. Recognizing figures from their bounderies: Determining parts of land masses and seas in the Soviet Union from their boundaries by drawing the corresponding boundaries on paper and then cutting them out from plywood. The student should learn to recognize parts of land masses (Africa, Australia, Asia, Europe, America, Antarctica), and seas in the Soviet Union (Black, Baltic, Caspian) from their boundaries.

Topic: Spatial Imagination
Content, Forms and Goals of Remedial Activities

I. Drawing different layouts and diagrams of paths: (1) sketching the layout of a classroom, lunchroom, and dormitory and creating the layouts in the form of cut-outs; (2) sketching a path from the classroom to the lunchroom, or nurse's office, or path for taking a walk, and then constructing the path in the form of cut-outs. The child should gain the ability to draw the layout of a classroom, lunchroom, or dormitory and a path between rooms in the school or a path for taking a walk.

II. Drawing the borders of a land mass, geographic points, seas, mountains, rivers, etc., indicating their relative positions on a blank sheet of

paper: Entering the directions north, south, east, and west on a blank sheet of paper, and correctly relating the geographic positions of (a) cities in the Soviet Union (Moscow – Leningrad, Vladivostok – Murmansk, etc.); (b) seas (Black – Baltic); (c) mountains (Urals – Caucasus); (d) rivers, and so on. The student should be able to indicate the compass directions on a blank sheet of paper, and describe the geographical relations betweenMoscow, Leningrad, the Far East, Black Sea, the Caucasus, and Ural Mountains.

III. Familiarizing the student with the flow directions of the major rivers of the Soviet Union: The student is asked to indicate on a map a number of rivers in the Soviet Union and to draw them on a sheet of paper, indicating their flow directions and correct relationships. The child's ability to schematically draw the major rivers of the Soviet Union and their flow directions on paper is developed.

IV. Demonstrating the four hemispheres of the earth and land masses and their relative locations: The student is asked to schematically sketch on paper the different hemispheres and land masses and create cut-outs of them. He is also asked to indicate the relative position of the different geographic entities and, and finally, construct a plasticine model of the hemispheres and land masses. The student should be able to arrange the northern, southern, eastern, and western hemispheres in their correct relative positions.

Topic; Temporal Imagination
Content, Forms and Goals of Remedial Activities

Determining temporal sequences in the course of reading essays from the textbook on such topics as: (1) "From the History of Our Land"; (2) "The Russian Revolution"; (3) "Life and Daily Activities in a Nation of Councils"; (4) "Heroes of World War II"; (5) "Life and Labor of the Soviet People After the War." The student is familiarized with these events and with the history of the government of the Soviet Union. He is asked to relate stories about famous people from different times in the history of the Soviet Union and to recall events that occurred during these years. The student is also asked to relate the periods of time he has studied and the history of his own family (for example, noting that "at that time my grandfather was at the front, and my mother was a little girl," etc.).

The student should be able to (a) determine temporal sequences in the course of reading essays on the history of Russia and the Soviet Union; (b) relate stages in the development of the Soviet Union with events in his own family and in the lives of his relatives.

Topic: Temporal Imagination
Content, Forms and Goals of Remedial Activities

I. Analyzing the contents of passages after having read them and de-

termining their central themes: Analyzing an essay or story. The student is taught how to correctly divide essays and stories into parts, frame a question for each part, and identify its central theme. He should learn how to analyze passages after having read them, identify their central themes, and be able to briefly recount what he has read.

II. Creative activities: Constructing an oral report on a given topic, for example, describing something seen or heard. The student should be able to create a story dealing with a given topic.

III. Working with vocabulary related to material on nature study and history. Studying the semantics of words related to material on nature study (coordinates, compass directions, the continents, etc.) and history. During this time, the student's knowledge of semantic import and terminology dealing with mathematics and nature study is formed.

Methods of Overcoming Defects in Pronunciation

From an analysis of defects in pronunciation, it became clear that in 95% of the children these disturbances could be attributed to dysarthric disorders of varying severity.

Individualized speech therapy techniques tailored to the different forms of dysarthria are needed to assess the effectiveness of rehabilitative work. To achieve such an assessment, we undertook a differential analysis of the symptomatology of hyperkinetic and spasmodic dysarthria and determined criteria that characterize the degree of severity of these forms. Observations were conducted on 150 children. In the speech therapy study, we developed a special technique by means of which it was possible to determine the state of the articulatory system when at rest, when attempting to speak, and in the course of the speech act. A neurological examination was conducted according to generally accepted techniques with emphasis on the mimetic and articulatory musculature. Electromagnetic studies were conducted by means of a two-channel electromyograph connected to skin electrodes (0.5 x 0.5 cm) fastened over the motor points of the speech muscles. These studies were also conducted at the start of the speech act and during the speech act.

In each form of dysarthria, we identified three levels of disability: mild, intermediate, and severe. In the mild form of spasmodic dysarthria, expressive speech is distinct, with only isolated sounds pronounced unclearly. There are slight difficulties observed when the child "engages" [*pereklyuchenie*] the articulatory system and isolated spasmodic manifestations in different parts of the speech-impellent system are seen.

In children with the intermediate form of spasmodic dysarthria, pronunciation of a third of all speech sounds is distorted in expressive speech. Even in isolation, these sounds connot be pronounced correctly. Spasmodic behavior is observed in all parts of the articulatory system and in the mimetic muscles.

In the severe form of the disease, expressive speech is indistinct and consists of isolated words rather than complete sentences. Pronunciation of most sounds is distorted. Synkineses in the mimetic muscles are observed in the course of the speech act, and spasmodic behavior is enhanced in the muscles of the limbs. Heightened spasmodic behavior is noted in all parts of the articulatory system.

Hyperkinetic elements are observed in the soft palate and tip of the tongue in patients suffering from the mild hyperkinetic form of dysarthria. The child finds it somewhat difficult to "engage" his articulatory system. In these patients, speech is distinct, though unclear pronunciation of individual sounds is observed in the speech flow; in isolation, though, these sounds are pronounced properly.

In the intermediate form, there are more hyperkineses, and the hyperkineses are produced in all parts of the articulatory system and the facial muscles. The speech flow of these patients exhibits distorted pronunciation of roughly one-third of all sounds. It is this factor which makes their speech difficult to understand.

The intensity of the hyperkineses is sharply increased in patients with the severe form of hyperkinetic dysarthria. Speech is indistinct, and nearly all sounds are distorted. Hyperkineses of the mimetic muscles as well as the muscles of the limbs and the trunk are produced when the patient attempts to speak.

The mixed form of dysarthria is characterized by a cluster of abnormalities in expressive speech and the articulatory system typical of the corresponding levels of disability in the spasmodic and hyperkinetic forms. Spasmodic dysarthria was diagnosed in 64 of the patients, hyperkinetic dysarthria in 37, and the mixed form in 49. Severe dysarthria predominated in all three forms.

Clinical observations of patients with spasmodic dysarthria carried out by a speech therapist demonstrated an abnormal tension in the respiratory system, vocal cords, soft palate, tongue, lips, and facial muscles, particularly in the state of rest between speech acts. In the course of a neurological examination of these children, the presence of hypomimesis, muscular hypertension and hyperreflexia of the limbs, and acutely pronounced tonic neck reflexes was noted. A slight increase in tension and synkineses in the mimetic muscles could be observed in the child as he attempted to speak. The child's speech has a nasal twang, a feature which points to spasmodic behavior of the soft palate. Respiration is usually shallow, weak, and clavicular, and is accompanied by synkineses in the chest and abdominal organs, sometimes involving the limbs as well. The patient's voice is hypophonic; the nasal twang decreases somewhat in the course of the speech act, the voice becoming more sonorous, and the synkineses decrease. These results may be attributed to a gradual drop in the tension of the corresponding parts of the arti-

culatory system. However, we did not observe significant changes in the nature of expressive speech in the course of the speech act, and so may assume that muscular tension drops only slightly. These clinical observations were confirmed by electrophysiological observations and data taken from a kymographic respiratory reading. The transition from rest to the speech-impellent act is not accompanied by a lengthy latent period, and an increase in tension, though not a marked one, is observed. From an analysis of the electromyograms, it is clear that in the state of rest there is virtually no bioelectric potentials in the muscles we studied, the conduct reaction is slight during the speech act, and the structure of the electromyogram unimpaired. Irradiating excitations is relatively low and no asynchronism is noted at this time.

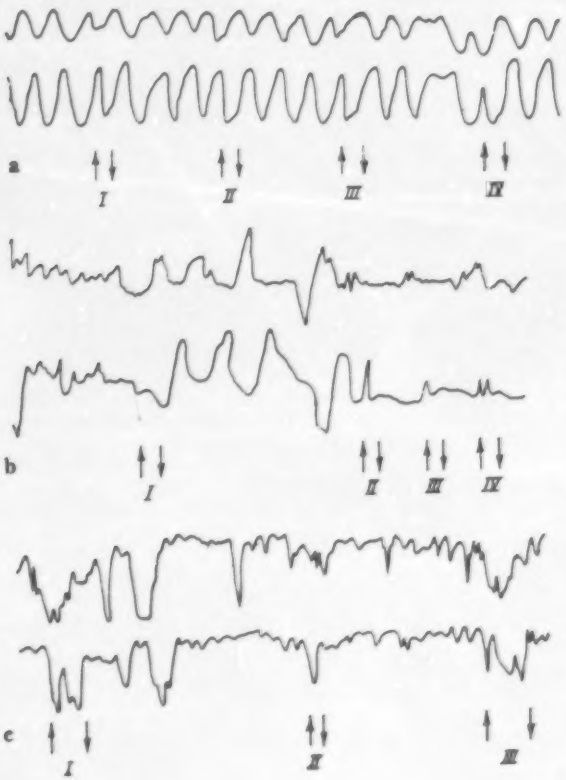

Figure 13. Myograms of speech breathing of the normal child (a), patient with hyperkinetic dysarthria (b), and patient with spasmodic dysarthria (c).

An entirely different pattern is seen in the case of hyperkinetic dysarthria. Confused, involuntary movements in the mimetic muscles and tongue that often extend to the limbs are observed. When the child starts to speak, there is a lengthy latent period between his first attempt at speaking and the pronunciation of the first sound. This form of dysarthria is characterized by irradiating excitation and acute synkineses in all organs involved in the speech act, in the mimetic muscles and cervical musculature, the limbs, and the trunk. In these children, pronounced asynchronism in all organs of the articulatory system is noted. The vocal cords do not close in temporal synchrony with the arrival of the respiratory stream, and the delivery of the speech and respiratory stream does not occur in synchrony with the contraction of the soft palate and the engaging of the muscles of the corresponding parts of the tongue and lips. The patient's speech is impulsive, the voice attenuating and then attaining its normal force; the tone of the voice is periodically accompanied by a nasal twang. In addition, the defects in pronunciation are not uniform; in the speech process, the same sounds may be uttered sometimes correctly, and at other times with distortions.

According to the electromyograms, there was a significant increase in background electrical activity starting at some level of impairment of the structure of the electromyograms and a sharp increase in the after-effect reaction; further, an electromyographic motor reaction produced by the transverse abdominal muscles when the articulatory muscles were stimulated could be demonstrated. In Figure 13 may be found myograms of the speech respiration of the normal child (a), the child suffering from hyperkinetic dysarthria (b), and the child suffering from spasmodic dysarthria (c).

To determine the methods and potential of compensatory activities, we selected 90 cerebral palsied children suffering from different forms of dysarthria. Of the 90 children, 32 were diagnosed as suffering from spasmodic dysarthria, 34 from hyperkinetic dysarthria, and 24 from the mixed form.

Special rehabilitation activities were conducted with the children at the Center of Specialized Board School No. 9, and also at divisions 11 and 12 of the Turner Research Institute. A control group consisting of 48 cerebral palsied children suffering from different forms of dysarthria was also formed. Non-individualized speech therapeutic activities were conducted with the children of this group. Directly preceding the speech therapy program at the boarding school, a session of self-training with children 10-15 years of age was held or medication designed to produce a one-time drop in spasmodic and hyperkinetic behavior was administered.

Lessons were also conducted at the Turner Institute together with drug therapy or after special anaesthetizing solutions had been rubbed into the facial skin, hands, arms, and neck according to the method descibed by V. M. Pigin.† By rubbing in these solutions, it was possible to depress the skin receptors and reduce the excitability of the corrresponding nerve centers.

These effects in turn influenced the efferent component of the muscular system.

These preliminary measures created a favorable background for the speech therapy program, as they helped to suppress the hyperkineses and reduce spasmodic behavior in the articulatory system. The actual techniques followed in the speech therapy program were determined by the clinical pattern, i.e., the form of dysarthria present.

The speech therapist who worked with children suffering from hyperkineses constructed the lessons in accordance with a series of stages:

(1) development of auditory control over the pronunciation of sounds;

(2) selection of a posture for the child in which the number of hyperkineses could be minimized;

(3) securing the child's limbs to suppress synkineses;

(4) developing synchronous rhythmic motions in the articulatory system in a step-by-step process: (a) between the delivery of the respiratory stream and the production of speech; (b) between the delivery of the speech and respiratory stream and movements of the tongue and lips, i.e., pronunciation of definite groups of sounds;

(5) improving the child's pronunciation of open and closed syllables, words, and sentences.

In spasmodic dysarthria, the structure of the speech therapy program changed substantially:

(1) training in auditory and visual control over pronunciation;

(2) development of kinaesthetic control;

(3) development of proper positioning of the lips and tongue in the absence of speech production;

(4) the sequence of production and correction of sounds is determined by the localization of spasmodic behavior; those sounds formed by the corresponding parts of the tongue and lips when exhibiting the least spasmodic behavior are treated first.

In the mixed form of dysarthria, the number of stages in the speech therapy program depended upon the dominant disorder. If the hyperkinetic syndrome was dominant, then a speech therapy program for this form was conducted, followed by the introduction of individual measures standard in the rehabilitation of spasmodic dysarthria, and conversely.

In our determination of the dynamic governing the rehabilitative program, we identified two levels or criteria: (1) improvement and (2) significant improvement. If a transition from a more severe level of dysarthria to a milder level occurred (say, from the severe level to the intermediate level, or from the intermediate level to the mild level), then improvement could be said to have occurred; if a transition *through* a level occurred, i.e., from the

severe form to the mild form, then the criterion of significant improvement was applicable.

From a statistical analysis, it became clear that the effectiveness of the speech therapy program increased 30% on the average when corrective measures were applied in accordance with specially developed techniques. It is noteworthy that there were no significant improvements in the control group of children.

Thus the results of our investigations lead to the following conclusions:

(1) from observations of the speech-impellent system in the state of rest, when attempting to speak, and during the speech act, it is possible to identify the symptomatology of the different forms of dysarthria;

(2) the identification of the different forms of speech disorder helps in the development of individualized methods for a rehabilitation program;

(3) by means of individualized speech therapy lessons, it was possible to achieve improvement in 40% of the patients and significant improvement in 4%. These figures were higher than in the case of the children of the control group.

Certain Data from an Experimental Study of the Mental Development of Normal Children and Cerebral Palsied Children

In September 1975 we examined 38 children suffering from cerebral palsy who had been accepted into the kindergarten and first grade of Special Boarding School No. 9 of the Leningrad Regional School District. Besides these children, we also studied normal children entering the first grade of a general educational school.

The examination was conducted in accordance with the technique proposed by David Wechsler (children's version) and graded in terms of the Wechsler Scale. We purposefully selected cerebral palsied children for the examination whose physical state would not prove an obstacle to participation in an experiment dealing with verbal testing and tests of manual dexterity. We first modified the different tests and presented them in a form better suited to the requirements of Soviet life, as the author had intended them for American children.

Repeated examinations according to this technique were conducted in May 1976 and 1977, that is, at the conclusion of the school year. During the two school years, the students were given lessons in a rehabilitative program and individualized speech therapy, besides general education classes in the kindergarten and first grade curricula.

A total of 10 tests were selected. The tests may be divided into two groups: I. verbal tests, and II. tests of manual dexterity. The first group related to (1) general information; (2) general understanding; (3) construct a designated figure from building blocks, using the Kohs technique; (4) construct a whole from constituent parts; (5) find one's way out of a maze.

According to the Spring tests, it turned out that (in the Wechsler Scale) six of the 38 normal children exhibited superior mental development (with scores of 120-129); 18, bright normal mental development (110-119); 12, average mental development (90-109); and two dull normal (80-89). No borderline or mentally defective zones were found.

Quite a different picture emerged in the cerebral palsied children. No child exhibited superior mental development, two had bright normal development, eight, average development, and 12 dull normal. A borderline zone (score of 70-79) was found in 13 of the children, and a mental defective zone in three children.

Especially marked differences between normal and afflicted children were discovered in the way they completed tests designed to measure vocabulary development (general information, understanding, vocabulary) and the growth of cognitive activity, primarily in the area of spatial imagery. Data obtained in the examination repeated at the end of the second school year provided information which we believe should be pondered by all specialists who work with cerebral palsied children. That is, in only one of the normal children (a boy) did we find a transition from the average to the bright-normal group. This result may consequently serve as a criterion for deciding whether the preschool period of the normal child provided an environment in which vocabulary and cognitive activity could develop in accordance with the child's age level. In turn, it could then be possible to correctly determine at once the child's mental capabilities. Entirely different results were found in the repeated examination of the afflicted children (Table 3).

Instruction in the school together with a specialized corrective and speech therapy program had an effect on the child's intelligence, increasing his level of mental development. As is clear from Table 3, two children in the average group advanced into the bright-normal group, four in the dull-normal group advanced into the average group, seven in the borderline zone advanced into the dull-normal group, and two in the mentally defective group entered the borderline zone.

Time of Examination	Level of Mental Development					
	Superior	Bright Normal	Average	Dull Normal	Borderline	Mental Defective
Before Instruction	0	2	8	12	13	3
After Instruction	0	4	10	15	8	1

Table 3

Dynamics of Mental Development of Cerebral Palsied Children as a Result of the Teaching Process

It is clear from these data how much care is needed in making a judgment as to the mental development of a child on the basis of a one-time test administration. The data also confirm the conclusion reached by N. and P. Botta: "In creating a scale, it is necessary to take into account the experience acquired by the normal child in the society in which he lives; this experience is greatly diminished in patients with motor disorders of cerebral origin." These results also confirm the need for a specialized rehabilitative program and the feasibility of such a program in the preschool period.

CONCLUSION

The cerebral palsied child has been shown to lag far behind the normal child in terms of mental and verbal development at developmental stages, according to a comparision of cerebral palsied children and normal children.

By seven years of age, children with cerebral palsy usually have not developed an ability to undertake phonemic discrimination and analysis. Poor visual perception and spatial and temporal imagination along with a delay in the development of two-handed functions and a sharply pronounced lag in the growth of vocabulary are also observed in these children. Each of these disabilities is combined with other problems. The children encounter difficulties in making generalizations and in studying arithmetic.

From an experimental study of a number of forms of cognitive activity and speech in 240 cerebral palsied children seven to 15 years of age, we were led to the discovery of certain developmental features of cognitive activity and speech in these children. Thus impairment in stereognosis was found in 197 of the children; interestingly, in most of the children astereognosis was observed in both the afflicted hand and the healthy hand. Defects in the visual perception of shape were discovered in 148 children. Typically, these impairments were invariably associated with asterognosis and a lag in the formation of spatial imagination. The latter condition was established in 178 subjects. From a study of reading and writing skills, it was found that 128 children exhibited dysgraphia and dyslexia, in 70 of whom the reading and writing disorders could be attributed to optical and spatial disturbances, and in 58 to underdevelopment in phonemic discrimination and analysis along with defects in expressive speech. Underdevelopment in temporal imagination was established in 65% of the children examined; temporal sequencing and the ability to decide how many events could occur per unit of time were particularly affected. From an analysis of the vocabulary of the afflicted children, it turned out that 85% significantly lagged behind in terms of expressive and receptive vocabulary. Particularly noteworthy was the absence from the child's speech of words that denote spatial and temporal trace imagery as well as generalizating concepts. Moreover, disorders in pronunciation were established in 75% of the subjects, with different forms and

degrees of severity of dysarthria affecting the bulk (96%) of the children.

We designed a program of remedial measures for extensive use in remediation of the mental and verbal development of the afflicted child. By means of this program, it was possible to largely compensate for functional impairment. According to our studies, psychological treatment and speech therapy provides some assurance of effective rehabilitation. In turn, the age at which therapy begins depends upon the diagnosis made in the early years. For this reason, in the present book we have presented various elements of the symptomatology of mental and verbal disorders in the cerebral palsied child from birth through ten years of age.

Many years of observation have demonstrated that these methods of remediation for mental and verbal disorders in the preschool child suffering from cerebral pasly can help in significantly improving underdeveloped functions and prepare the child for assimilating the curriculum of the general education school. As is clear from our data, lessons that are part of the remedial program presented in the instructional period in elementary school tend to produce partial or complete compensation of developmentally lagging functions.

Experience gained in the treatment of dysarthria using the above speech therapy program showed that its effectiveness increases appreciably if the different forms of the disorder are distinguished, that is, if individualized methods of rehabilitative therapy are applied. Data from a comparative experimental analysis of the level of mental development of the afflicted child, before and after instruction, have shown the need for caution when dealing with the results of one-time testing programs. In such programs, it is not always possible to take into account the child's past experience nor the need for individualized remedial treatment and speech therapy in the preschool period.

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U.S. COMMENTARY

by Leslie D. Park, *Executive Director, UCP of New York City, Inc.*

On
"Methods of Improving the Cognitive and Verbal Development of Children with Cerebral Palsy"

by L. A. Danilova (translated from Russian)

At last, we have a first person report by a Russian professional (psychologist) on a phase of rehabilitation for the cerebral palsied in the Soviet Union!

For many years, rehabilitation professionals in the United States have longed to know something about the "state of the art" in Russian rehabilitation. Outside of an occasional visitor's report, there has been very little in U.S. literature, professional or popular, to indicate what techniques are being used to served the large number of disabled people in the vast areas of the Soviet Union.

The author says, "This book has been written for speech therapists, psychologists and educators engaged in the treatment of children with cerebral palsy for disturbances in cognitive and verbal functions. It may prove useful to pediatricians, pediatric neurologists and psychologists concerned with the early diagnosis and rehabilitation of cerebral palsied children. Further, the methods discussed here can also be used for children (in suitable age groups) with retarded cognitive and verbal functions caused by different etiologies."

I found the book an excellent "how to" for teachers and speech therapists who want to apply some of the system and techniques advocated by Ms. Danilova. It is virtually a "treasure trove" of excellent clinical and classroom techniques for teachers and therapists. The research is well documented and obviously represents a great deal of experience and much "trial and error" in the classroom.

The book begins with a broad historical research review which quotes from many western hemisphere researchers, such as Cruikshank, Haeussermann, Cardwell and Bobath. I found this particularly interesting since we in the United States generally do not have access to what is apparently a considerable volume of good research literature from Russian practitioners, researchers, and writers. Whereas the U.S. and Western-European professional literature is obviously available to the Russians, there is very little from the Soviet Union that has been translated into English.

The author claims that the U.S.S.R. "was the first country in the world to take upon itself the responsibility for caring for crippled children." (Resolution of February 25, 1932, Council of the People's Commissars of the Russian Soviet Socialist Republic Decree, No. 666 of the U.S.S.R. Ministry of

Health, and No. 679 of the Ministry of Health of the Russian F.S.S.R. and others.)

Although western readers may challenge this statement, it *is* a fact that the Soviet government has undertaken an extensive system of institutes, rehabilitation services and educational programs to deal with handicapped children. The author also states that other countries are largely dependent upon private, non-governmental funding for services. This, of course, is not true since most western countries have instituted public programs to pay for services to handicapped children in education and rehabilitiation.

What this may say is that there is little understanding by Soviet rehabilitation workers of what other countries have developed in their national laws to serve handicapped children and adults.

The research and the systematology developed in this work come from observations conducted on 1,000 cerebral palsied children being treated at the Turner Research Institute for Orthopedics and Traumatology, Leningrad Boarding School No. 9, and the Komarovo Sanitorium.

U.S. readers will find the testing methodology very interesting and will want to compare it with psychological tests now used in the U.S. with brain-injured children. For instance, stereognosis, or the differentiation of different geometric shapes placed in the hands, is a common test.

I had problems with one of the chapters dealing with the comparison of cognitive and verbal development in the so-called normal child and children with cerebral palsy. There seems to be an undifferentiated diagnosis of "cerebral palsy". Obviously, the generalized description of what a cerebral palsied child does depends on the kind and severity of the brain injury. For instance, a cerebral palsied child is described at 18 months: "does not walk and can stand only with the use of stays." Any practitioner may challenge this and say that a cerebral palsied child often does stand and walk at a normal age depending on his condition (ataxic-mild). This is a minor criticism, however, and the chapter has much to commend it in the excellent descriptions of normal developmental activities.

The bulk of the book is given over to teaching systems and techniques used in dealing with cognitive and verbal problems. This is where I found the book rich and extremely worthwhile.

It is quite obvious that some very careful observations, over a long period of time, have gone into this work. Recommendations from these observations provide some excellent teaching techniques which are very worthy of study and trial in the classroom.

The author claims improvement for children exposed to these techniques during their school years; however, convincing documentation and research is absent in this respect. This does not diminish the fact that the techniques being advocated are sensible (some are unique and even brilliant) and would be expected to have some positive remedial effect on brain-injured

children.

A strong case is made for early diagnosis and concentrated remedial work. One would like to know more about the structure of the rehabilitation day, classroom hours and what may constitute a therapy session.

I hope that this work is among the first that we will see in translation in the years ahead. It is obvious we have much to learn and share with our Russian colleagues.

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Institute of Rehabilitation Medicine
NYU Medical Center
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"Innovations in Mobility (Wheelchairs)." *Switzerland* and *Holland*. Fellowship Date: May 15-June 15, 1982.

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Requests for fellowship reports and monographs should be addressed to:
Diane E. Woods, Project Director
World Rehabilitation Fund, Inc.
400 East 34th Street
New York, NY 10016
Please request by author's name and fellowship award number.